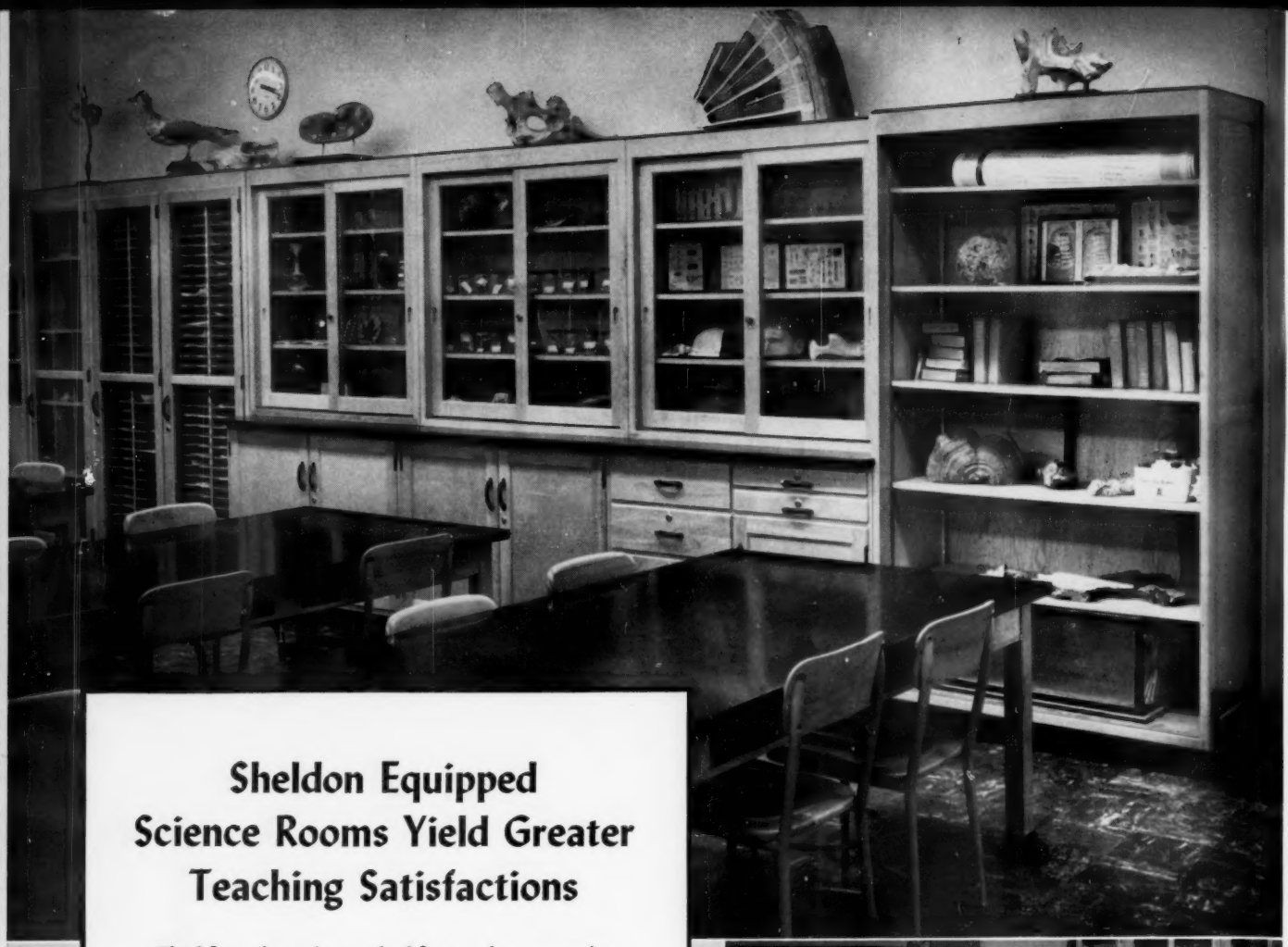
OCTOBER 1952

THE SCIENCE TEACHER

- Non-Academically Speaking
- Resources For Elementary Science
- The Demonstration In Health Education
- Science Teachers Win Awards
- Visualizing Geological Faults

JOURNAL OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION



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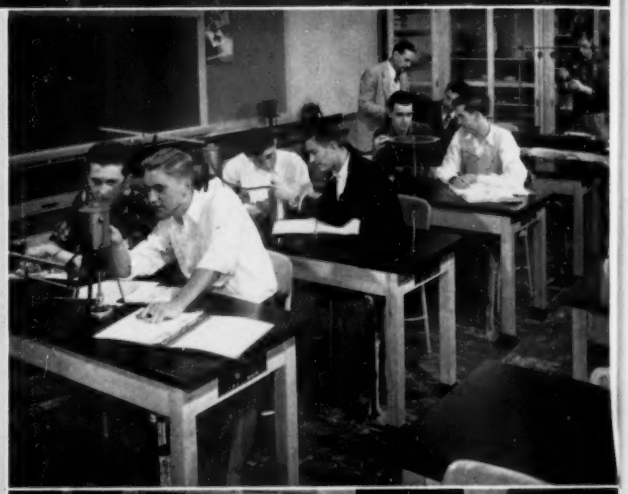

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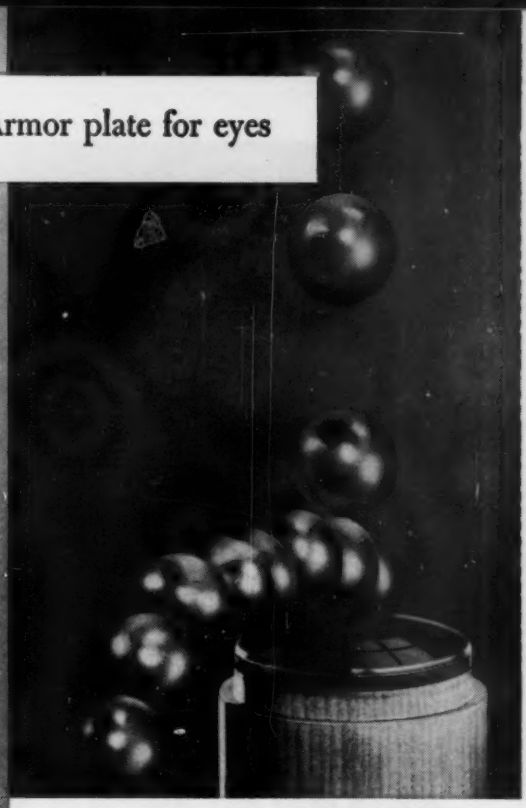
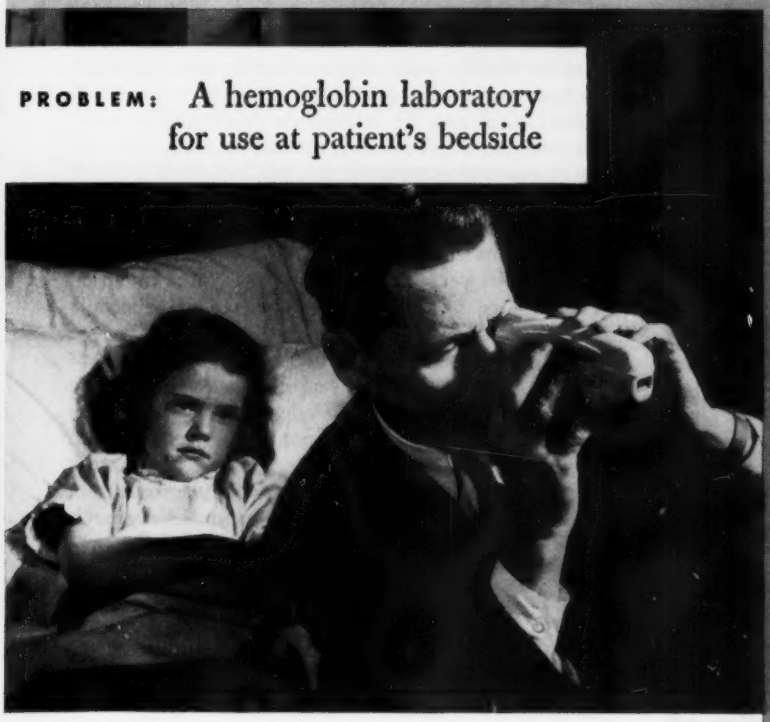
PROBLEM: Armor plate for eyes



ANSWER: If you dropped steel balls on *your* glasses, they'd shatter in dangerous splinters. AO safety-goggle lenses won't splinter. Scientists at American Optical devised a heat treatment that makes glass many times as strong, eyes safer.

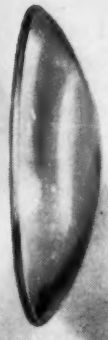
PROBLEM: A hemoglobin laboratory for use at patient's bedside



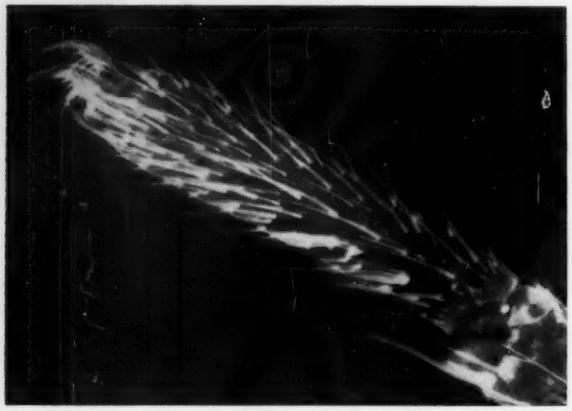
ANSWER: Today, a physician need not send blood samples to a laboratory for hemoglobin analysis and delay diagnosis. Within 3 minutes, he can read the answer in the Hb-Meter. This meter is so fast that a patient's condition can be watched during treatment. Heart of the instrument is an accurately polished glass wedge, graded in color, against which the blood sample can be matched. The Hb-Meter is a creation of American Optical Company.

PROBLEM: To keep movie film from catching fire

ANSWER: *Right,* film shielded by ordinary glass catches fire. *Left,* AO heat-absorbing glass prevents fire. This glass, developed for floods and projectors, absorbs 90% of heat from projected light, passes movie-film color in true values. Write to us for any additional information. American Optical Company, 96 Vision Park, Southbridge, Mass.



American Optical



THIS MONTH'S COVER . . . is a negative print of a spider's foot made by projecting the image directly on enlarging paper in the dark room for a few seconds and then developing. Focusing was first done on plain white paper. The print was made by members of the Micro Club of Emerson Junior High School, Lakewood, Ohio. Club advisor S. Alton Yarian won an award in the 1952 Science Achievement Awards program for his entry describing the operations and activities of the Micro Club.

Guided Missives

. . . Ordinarily, a response to a year-old book review would probably be absurd. However, when an educational milestone (that is *this* writer's opinion) is unjustly criticized, it is perhaps not too late, even now, to reply. Extended travel during the past year has made an earlier reply impossible.

I have reference to the review by Keith C. Johnson of *Basic Science* by J. Darrell Barnard and Lon Edwards in the April, 1951 issue of THE SCIENCE TEACHER. One hesitates to be disrespectful of another's opinion since the converse seems to be a desirable scientific attitude. However, when such an opinion may be the deciding factor between a book being accepted or rejected, the right to an exclusive opinion should be predicated upon certain justifiable assumptions which in this case are not apparent—such as: that the reviewer convey to the reader a reasonable account of the book, and that criticisms good and bad are founded upon fact rather than conjecture. True, anyone is free to read the book and determine its merits for himself; but there are those too otherwise occupied to read all new books and who must necessarily rely upon reviewers' opinions. Therefore, I urgently request that at least one more opinion of this book be given space in our Association journal.

Mr. Johnson's major adverse criticisms were these: "Although not stated, this book seems to be written for the ninth grade"; and "The greatest weakness is to be found in the larger number of units and the wide field of science to be covered in one year." The first of these is based upon a mistaken assumption and, without supporting evidence, it is questionable whether adverse criticisms may be based upon this initial premise. Other teachers I have consulted find value in the wide range of grade level material this book offers. Certainly, many units give the teacher and class a greater choice of material, which is desirable for too many pedagogical reasons to mention here. As for covering the material in one year, which was not the stated intention of the authors, would it be poor pedagogy to begin a learning process which would not be completed in one year? Is it inadvisable to encourage the learning process to continue after the school year is ended? Are the life adjustments and applied knowledge learnings, which as the reviewer points out are (among) the factors which make this book outstanding, to be terminated one week before the Fourth of July? A more tenable conclusion may be drawn that the authors are purposefully engineering a learning process which will continue throughout the life of the student.

In reference to the reviewer's statement, ". . . no one area can be covered thoroughly—none are.", at least one educational concept which the authors probably had in mind was that of helping the teacher to help himself. It would be a poor text that tried to do everything for the teacher, and a poor teacher for whom a text could do everything.

In reference to the pictures, credit is given to the excellent three-dimensional illustrations; however, it was stated that ". . . there are many illustrations which seemed to be used as fillers, rather than related to the text materials." The intensity of the reviewer's search for relatedness is questionable. Those pictures which *seem* to be used as fillers and unrelated to the text, upon careful examination, are found to be definitely related in one or more ways to the educational objectives of the text, of which the subject matter content is only one. The questions accompanying the pictures are positively related to the attitude and method development of the scientific objective. This, to me, is another innovation worthy of considerable praise, as is the technique of the authors' of using the picture to refer the child to text.

Where the reviewer did give credit, it seemed to be with an unshared lack of enthusiasm: "One of the best features of the book is to be found in the summary and activities at the end of each unit. Well-organized demonstrations and experiments, tests of ability to apply knowledges gained, self-tests, suggested investigations, projects, special reports to be made by pupils, and tests of ability to interpret data presented in chart form make this book outstanding in its field. A double

(Please continue on page 244)

THE SCIENCE TEACHER

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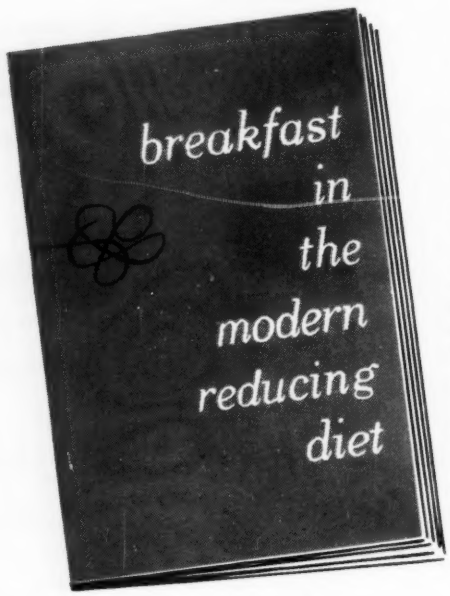

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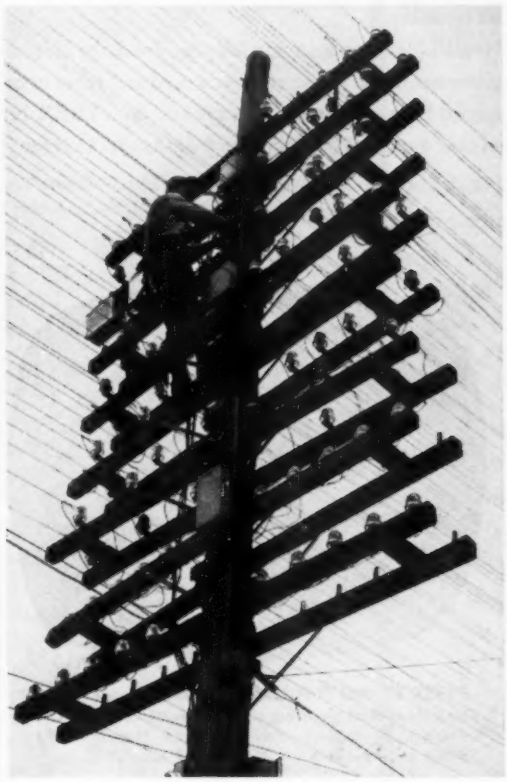

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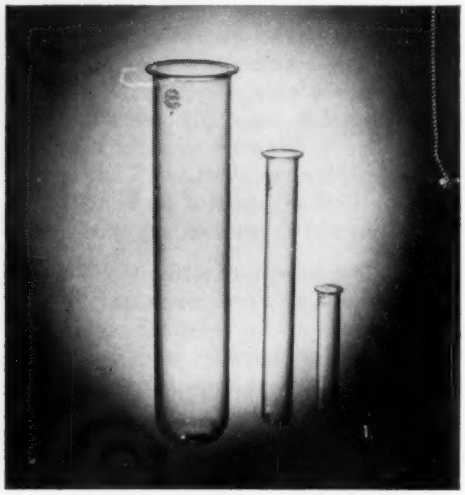

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*"Which Test Tubes Shall We Buy" — W. S. Lapp — Science Teacher Vol. XVII, No. 3, October 1950

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THE SCIENCE TEACHER

Vol. XIX, No. 5 **October, 1952**

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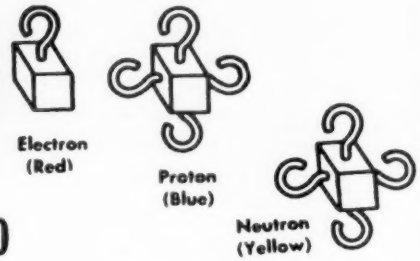

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Experience with a Science Teaching Plan

MARION B. SAVIN and HAROLD J. ABRAHAMS

IT WOULD be a "painful delineation of the obvious" and a waste of our readers' time, were we to give space to the development of the fact that the general class-room situation is far, far different from what it was a score of years ago.

For good and sufficient reasons we have seen the *Passing of the Recitation* * take place, leaving in its wake all manner of plans for the teaching of the various academic disciplines in the high schools of today. Among the better known of these schemes are the plans of Dalton, Winnetka, Morrison, Miller, and others.

During the years when such plans were winning adherents there existed sufficient justification for their adoption. In an era when the use of traditional teaching methods grows steadily even less applicable and suitable, it becomes urgent for high school teachers to cast about for methods which are in truer harmony with a steadily evolving socio-economic system.

The present writers are aware that the struggle to shape methods of science teaching to meet the needs of our students in an era distraught by television, war, the machine, and the atom has called legions of teachers to join the common pedagogical battle. Our attempts at a solution to this problem of teaching large, differently prepared classes with ever-increasing numbers of questionably-adjusted members can lay claim to nothing startlingly new. We merely report the results of our attempts, confident that for us, at least, the following method is workable and that it places the challenge where, from the days of Socrates it has always been, namely upon the learner.

Our plan is as follows: We have developed a complete set of "work-sheet," answers to which may be written either in a note-book or on the work-sheet itself. With the text book (and any other suitable material) before him, each student develops the answers required by the work-sheet. The entire class period may be devoted to this activity alone. Part or all of the next class period may be given to a discussion of the work of the previous day, the discussion-leader being either the teacher or a student, as many students as possible participating in the discussion. Discussions generally require less time than work-sheet activity and may therefore take only a part of the class-period time. For the remainder of the period the class returns to the work-sheet. One discussion period may follow two work periods, or any other apportionment may be made which seems best suited to class needs. It is during the discussion period that the teacher can be effective in remedial work, enrichment, inspiration, and guidance. Here he can emphasize the ways of democracy

* "The Passing of the Recitation"—Thayer, V. J., Boston, D. C. Heath and Co., 1928

May an editor publish an article and at the same time politely indicate his complete disagreement with the philosophy, hypotheses, and contentions of the authors? We are yielding to temptation, at least this once; will sit back now and await the brickbats and bouquets.

Miss Savin has the M. S. in science from the University of Pennsylvania; has done work at the Marine Biological Laboratory at Woods' Hole; has travelled widely in Europe, the Central Americas, the West Indies; has taught in Philadelphia public high schools twenty-six years. Dr. Abrahams is a graduate of the Philadelphia College of Pharmacy; obtained his doctorate in chemistry from the U of P; is Sigma Xi; has travelled in Europe, Asia, and Africa; has taught in Philadelphia public high schools twenty-five years. He has written widely for scientific and educational journals, and many of his articles in *School Science and Mathematics* were put to good classroom use by your editor in years past.

So it is with respectful diffidence that we question whether "No better use can be made of classroom time than in learning how to study a printed page." We question whether a teacher is rendering most effective services to students in science by requiring them to sit at a desk and grind out book answers to questions on a worksheet, meanwhile sitting at his own desk where with no distractions "he can construct the work-sheet for the next topic." We wonder why, on the biology work-sheet, students should be cautioned to *read slowly*. We doubt that *anyone* can answer the *why* asked for in the first question on the biology work-sheet. We wonder whether a student would "get credit" if he truthfully answered "Nothing" to question 2 under *Physical Properties* on the chemistry work-sheet.

We have placed this article and the next one by Miss Stein somewhat in juxtaposition and would like to have from our readers their reactions to the two points of view.

and self-discipline. A sample fragment of a work-sheet for a biology class and one for a chemistry class are given below. While many such books are now on the market, many teachers may feel that the needs of their classes are better met by work-sheets prepared with local conditions in mind. The labor involved seems very great, but this difficulty is more imagined than real, since the project, once started, rolls along smoothly, during hours when classes are quietly at work solving the problems and answering the questions by the use of text-books, specimens, charts or any special means of research available. The teacher is ready to answer reasonable questions asked by students who are experiencing honest difficulty or who show maturity beyond the general level of the class. There being no other distractions to a teacher than those just mentioned he can construct the work-sheet for the next topic while his students sit before him, and therefore work in the full awareness of their differing needs, abilities, interests, and readiness-to-learn. Once completed, such a task may need only an occasional or slight revision, here or there, so that profits begin to accrue from the second semester of their initial use. (The work-sheets may be collected after use if the teacher elects to have answers written in a note-book, this procedure making constant mimeographing unnecessary.)

Example of the Use of a Work-Sheet in Biology

General Area—Adaptation for Survival.

Unit—Seed Dispersal.

Materials—A box of fruits and seeds from garden and wayside collected by the student, a hand-lens, the biology text-book, the student's notebook, the work-sheet.

Portion of a Work-Sheet on Seed Dispersal

Using Pages . . . to . . . :

Read slowly and study the pictures.

Answer these questions in your note-book.

1. Why does a plant produce so many seeds?
2. Which seeds will develop into healthy plants?
3. What happens to the seeds that fall into an unfavorable environment?
4. Among human beings are the offspring affected by an unfavorable environment? Explain briefly your answer.
5. List 6 agents of seed dispersal.
6. Using your hand-lens and the specimens in your box of fruits find as many structures as you can that fit these seeds for being scattered by each agent.
7. Make simple diagrams of these structures and place under each the name of the agent by which it is dispersed.
8. Because of civilization what other agents, in addition to natural ones, transport seeds?
9. Describe some ways by which weed seeds from other continents get into our country.
10. What measures does our government take to keep harmful plants out of our country?
11. Which agent of seed dispersal is the most difficult for the farmer to control?
12. Name 3 ways by which the farmer gets rid of harmful weeds.
13. Birds are fine insect controls. If we clear out all weeds and underbrush why do birds disappear?

Example of the Use of a Work-Sheet in Chemistry

Aluminum

Occurrence

1. Is aluminum found native? (Give reason.)
2. What is its "order of abundance"?
3. What common substance, present everywhere, contains a good percentage of aluminum?
4. Name 3 silicates of aluminum which occur in nature.
5. Tell what action CO_2 has upon feldspar.
6. Give the name and formula of the fluoride.

[Note: (a) the silicate radical is SiO_3 (valence minus two) (b) three elements present in fertilizer are nitrogen, phosphorus, and potassium.]

Extraction of Aluminum

1. Name the mineral from which aluminum is made. What kind of energy is applied?
2. What second mineral is used in the process. Why?
3. What material is used to make the cathode? The anode? Why?
4. Why must the starting material be pure, and from what is this obtained?
5. How can you tell when the material is consumed (or "used up")?
6. What is then done?
7. Where does the aluminum collect?
8. What other product forms?
9. What happens to the other mineral used at the start?
10. Give the name of the man who invented this process.
11. What can be said of the purity of the aluminum made by this process?

Physical Properties

1. What is the color of aluminum? Is it capable of a high polish?
2. What can you say about its:
   (a) hardness and strength?
   (b) ductility and malleability?
   (c) conductivity of heat and electricity?
3. State its specific gravity. How does it compare to glass and porcelain?
4. State its melting point.

Chemical Properties

1. How does powdered aluminum behave on *heating?*
2. What happens to the surface of aluminum when *melted?*
3. State the effect of dry air and moist air upon aluminum. Is this typical? Explain rather fully.
4. Write an equation for the effect of heating a mixture of chromic oxide and aluminum.
5. Therefore, what kind of an agent is aluminum?
6. State the action of HCl, HNO_3, and H_2SO_4 on aluminum.

We have noted the following advantages of our method:

1. The work becomes "individualized."

(a) Many students have difficulty in starting their home assignments when these are made in the traditional way. The work-sheet method starts the lesson with a definite task, thus allowing no "starting difficulty" to arise.

(b) No problem of concentration on the work assigned arises, since the assignment is sharply focussed on the day's work.

(c) The "I can't understand it" resistance is overcome, since the teacher is present to explain any sincerely-felt difficulty; this assistance, furthermore, being available at the moment it is needed, not "next day", after the results of the difficulty may have succeeded in killing interest.

(d) The teacher is spared the disappointment of hearing the ancient and too frequent "I'm not prepared today."

(e) An easy check is available on how students attack their work and on how steadfast they are, because the teacher will want to "circulate" around the room during part of the period and inspect the work of students with whatever degree of scrutiny seems desirable. This provides an ideal opportunity for pupil-teacher contact.

(f) This "laboratory method" may give the better endowed student an early training in "research" —such a rapidly-working student may spend the rest of the time allotted to a unit reading a more advanced text-book, or other collateral material.

(g) Students who are accustomed to sitting back while others carry on a classroom discussion are compelled to work out their own answers and thus have self-reliance forced upon them.

(h) Every member of the class finishes a unit with a good set of self-prepared notes from which to prepare for the evaluation unit.

(i) Learning proceeds in a favorable climate—no distractions from listening to "Jump-along-Somebody-or-other."

2. Efficiency as a Method

(a) We make no claim for having made a truly scientific study of the results of our method. Yet we know, as teachers can always know, in qualitative ways and by means of the criteria developed by the newer types of tests, that a higher percentage of our students has been "reached" and this to a less superficial extent.

(b) One attempt to make a quantitive measurement gave gratifying results: In classes of biology the Presson Biology Test median was just about the same as that predicted by the makers of this test, in spite of the facts that:

(I) These classes were taught by a teacher of chemistry, who had only once before (ten years earlier) taught but one class in this subject.

(II) A total of only 30 minutes had been allowed to a test for which 38 minutes should have been allowed.

(c) We feel that this method puts an end to the tendency for students to "close their minds while keeping their eyes wide open" as is so often the case when the lecture-recitation method is used.

(d) By working under supervision of the teacher students are forced to experience the art of acquiring knowledge from a book (the technique of problem solving, etc.) by self-activity and to a more intensive degree, than when sent home with a textbook and turned loose to flounder around without a set goal.

Thus we feel that we attain more closely the ideal of Pestalozzi, who, it will be remembered, strove to cut through "the glut of words".

Since the printed word is still a powerful conveyor of ideas and since it must in the future fight for the mind of man against the emotion-rousing mediums of the television, poster and sound-truck, no better use can be made of classroom time than in learning how to study a printed page. Here the ability to judge, analyze, and discriminate must be developed and a classroom device which can accomplish this is a valuable tool.

Non-Academically Speaking

By CORA B. STEIN

THE SOPHOMORE YEAR in high school is a difficult year for many young people. This difficulty is noticeable particularly among the non-academic students, many of whom become restless, indifferent to school, and unhappy in their work. Consequently they may leave school to find something more challenging and what seems to them of greater significance.

In the spring of 1950, our school principal presented the challenge to three members of the staff—a member of the Social Studies department, a member of the English department, and a member of the Science department—to see what each could do to help a group of non-academic sophomores derive a more satisfying experience from their second year in high school. It was my opportunity to face the challenge with one of the groups, using the subject of biology as a means for achieving the goal.

Each teacher worked independently. The membership of the class varied slightly in the three groups. There were originally twenty-two members in the biology class—eleven boys and eleven girls. One boy left in the early weeks of school to attend vocational school; one girl left at the end of six weeks to attend private school; and one boy left at the end of eight weeks to join the armed forces.

The distribution of the abilities of the remaining students ranged from "average" to "inferior" and "very inferior," using East Orange terminology. (The "average" East Orange pupil is somewhat above the national norm.) The reading abilities of the members of the group, according to tests given at the eighth grade level, ranged from 5.7 to 9.6, the median being 7.4. In short, then, approximately 50 per cent of the group were average in general ability and reading ability, and 50 per cent below average. The members of the group were alike, however, in that none of them showed a high degree of initiative. There was no known outstanding leader in the group.

It was not felt necessary to cover all the subject matter usually discussed in a biology course. The young people were free to plan the course with the teacher's guidance; there was no predetermined or even tentative course of study. We covered items of interest to the students, chiefly those dealing with the variety of plants and animals, conservation, health, and human anatomy and physiology.

To illustrate how the course developed, let us begin with our program in September. After a discussion of the meaning of biology and the topics it included, the students decided they wanted to know more about the living things around them. So we went across the street to explore a field. This study of life "in the woods" led to an examination of the shrubs in front of the school and of the school lawn. An idle comment on the poor condition of the lawn led to an attempt to rid the lawn of dandelions, plantain, and crabgrass. This was an excellent motivator for the study of weeds, and consequently the study of plants—their root systems, leaves, seed dispersal, and so on. During the discussion of living things the relationships of symbiosis and parasitism were brought up. The work on parasitism led directly to our next unit, Communicable Diseases and Their Control. And so one topic grew out of another.

Characteristic activities carried on during the year by our group included the following:

1. Group work as well as individual projects. For example, a health exhibit was set up. Each

New and novel approaches to more effective science instruction are always welcome. This article reports on one school's efforts to utilize certain subject matter areas and teachers in promoting better pupil adjustment within the school, particularly among the so-called "non-academic students." The experiment went on in the Clifford J. Scott High School, East Orange, New Jersey. In this report the role of biology is outlined. Miss Cora B. Stein was the teacher.

Helpful as it is, we could wish that the report had included more information about the course itself—its content of subject matter and activities—how the various topics were developed, and how the class in the end compared with other biology classes and with the groups in Social Studies and English. We venture the guess, however, that interested teachers who write to Miss Stein along these or other lines will receive further information promptly.

student contributed something to the exhibit and each one was responsible to the leader of his group who, in turn, was responsible to the exhibit chairman.

2. Field trips. We visited the Newark Museum to see a health exhibit, and we visited the East Orange Board of Health.

3. Visual aids. Charts, models, films, filmstrips, and specimens were used extensively.

4. Oral reports. Numerous such reports were required.

5. Textbook work and laboratory work. Textbooks were used and laboratory work; for example, the microscopic study of the cell and the dissection of a frog, was undertaken. In other words, old procedures were not automatically discarded.

6. Tests. Tests were given where the mastery of subject matter was expected. Vocabulary was minimized. Emphasis was placed on biological principles, using a minimum of scientific vocabulary.

7. Evaluation. We considered evaluation and testing to be two quite different procedures. More about this later.

It is evident that few, if any, of the methods outlined above are new in the teaching of biology. We felt, however, that in our setting the greatest deviations from customary procedures were in: (a) the amount of pupil participation in planning the units and the release from a preordained course of study; (b) the length of time used in the study of a unit; (c) the number of field trips undertaken; and (d) the evaluative techniques employed.

Now, how do we—the teachers—feel about the experiment? In biology, at least, the increased amount of teacher-pupil planning led to a greater interest on the part of pupils. Of course everyone was not equally interested in each phase of work, but the general interest was fairly high. The fact that the amount of material covered was not important led the teacher to be less concerned with subject matter and more concerned with individual growth and development of pupils. Positive gains, we believe.

Group activities, such as producing the health exhibit, had many practical values. Cooperation with other members of the group, a feeling of responsibility for the welfare of the group, and the acquisition of certain worthwhile facts and skills were among the outcomes. One student said that she thought the best thing about the exhibit was the way everyone had worked together and everyone had contributed something.

Field trips lent variety to the school day and seemed to be of particular benefit to the general student. The trips served as motivators as well as instructors. More trips would have been desirable, but the expense of trips, which had to be borne by the students, was a handicap.

The average "non-academic" student dislikes reading and consequently visual aids afford a less painful way of learning. We felt that sound films were of particular value.

Oral reports afford an opportunity to develop poise and articulateness. It took one student six months to develop the willingness to give such a report. Finally she did churn up enough courage to try. The class was attentive and the student felt quite satisfied with the results of her effort.

Emphasis on the study of current biology was valuable in that students became aware of the importance of biology in everyday life. I hope it widened their interests and made them more lasting.

The variety of activities provided during a class period and during the week met the need of students with short attention spans. Consequently, they became less bored; and the teacher felt happier with the new situation.

The use of conventional methods of instruction made the students feel that they were like others who were taking the "standard" biology course. This desire to be like others is a strong desire in teen-agers. The textbook was used as a reference, however, and not as a course of study. Most of the students liked definite, short-term assignments and these were possible when a textbook was available. Textbooks also afford an opportunity to work on other goals of instruction such as the development of skill in the selection of important ideas from paragraphs, and learning to use an index and a glossary.

Most of the students wanted to master a vocabulary of scientific words related to their own bodies, but no attempt was made to have them master words that did not apply to themselves. Everyone seemed relieved at not having to memorize a technical, non-functional vocabulary.

Student-teacher evaluation helped each student better to understand the goals of the course as well as to understand himself. Utmost consideration was given to the accomplishments of each young person in the light of his own ability. Conferences were held at the end of several marking periods with each member of the class, and the evaluation of the individual was discussed. Each student evaluated himself and then a comparison was made of the teacher's evaluation and that of the student.

On the whole, the students in this group seemed to get greater satisfaction out of their work than is usual with non-academic groups. This was evidenced when one student asked, "Why can't we

have a second year of biology?" Student growth in many directions seemed to be the result of our work. The students seemed to accept responsibility and to work cooperatively better than in most comparable groups. They seemed happier. Records showed that there was less absenteeism in this group than in others. The teacher was happier, too, for she felt that her work was really producing desired results. The class was not without its problems, of course, but most of them were solved to a greater satisfaction for both the teacher and the pupil. Because of the small class, there was a friendly, informal atmosphere. This enabled the teacher to get closer to each student; and so each student appeared as a personality and not just another teen-ager. No doubt the students felt that the teacher was more of a person, a friend wanting to help, and not a "slave-driver."

Summary

With non-academic minded young persons, a greater degree of success is attained in teaching biology if pupils help in planning the course, if the time element is flexible, if group activities as well as individual work are encourged, if field trips are taken, if a variety of activities including a variety of visual aids are used, if scientific vocabulary is minimized, if self-evaluation as well as teacher evaluation is employed. However, this method of approach can be successful only when classes are small enough to establish proper rapport between pupil and teacher.

Resources for Elementary Science

By J. MYRON ATKIN

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TEACHERS OF SCIENCE in the elementary schools are urged to emphasize a problem solving approach. This method, with its resultant demands on the resources of the classroom teacher, requires that a wide variety of materials be available and usable by youngsters. Frequently, science work is undertaken by a particular class because of its relationship to another area being studied. When the science problems that are raised are of sufficient breadth, there is a need for an abundance of materials to assist the children in finding some answers to their problems. It becomes evident when this point is reached that no single source of information, like a science textbook, will give elementary school youngsters sufficient information to solve their science problems completely or even satisfactorily. If a good portion of the work is to stem from the children's investigations rather than from the teacher's demonstrations or expositions solely, this type of advance planning by the teacher becomes important. Because of the types of resource material available in most schools, this type of planning is also difficult. In a science program related to the total experiences of youngsters, a single science text cannot anticipate the variety of problems that will be raised. Those raised in one second grade may not recur in another.

For example, the storms in the North Atlantic during last winter were of front page interest for several weeks because of the heroism of Capt. Carlson. One fifth grade class was shipping some material to England at the time and became interested in the type of weather that their packages would be subject to en route. Many questions were raised about causes of severe weather and about how we know what the weather is going to be in advance. Here was a need to solve some very specific problems in connection with weather. Before making definite plans with the group, the teacher had to investigate the materials available which would help to answer the science questions raised and would be at the maturity level of the children in the class.

In most schools, there are a few children in each grade who read below or above grade level. There may be fourth-graders, for example, who read at seventh grade level. A fourth grade book only in such a classroom could not meet the requirements of the entire class. Also, since all the text series divide subject matter among the grades, the fifth grade class mentioned above could not find material about weather in several fifth grade science books. It is important to have other books available. One third grade book contains material on thermometers that is interesting and meaningful to a fifth grade group studying about weather; yet the vocabulary level does not discourage the less advanced reader. Upper grade books could be used by advanced readers.

A workable solution is to have a central collection of all science books to be drawn upon as books are needed and returned when the work is com-

pleted. In the collection would be copies of all science text series from primers to, say, grade nine. When the fifth grade pupils have planned their work on weather, a committee could then take from the collection all those books pertaining to their problem. By such a system, not only are different maturity levels within the classroom met, but a much wider variety of informational and experimental material is obtained. The poorer reader can demonstrate his liquid thermometer made from referring to a third grade book and get great satisfaction as well as making a valuable contribution to the group.

A central science collection like this is less expensive than attempting to purchase a complete set of science books for one class. Elementary schools today encourage group work by children. This system helps to make such work possible.

By a method of pooling resources, another aid—picture files—can be built up that can benefit each class. Much of the timeliness of science problems is pointed up by newspaper and magazine clippings. A combination of articles, pictures, pamphlets, and books can give each group working on a problem sufficient research material to probe. Too often, a child must do research from one static source. Three years from now, a group working on weather can profit by pictures clipped today about the sinking of a ship by a storm in the North Atlantic.

Resources for Experiments

In addition to a text and clipping collection, an equipment collection is also a valuable asset. It is common practice to have a storeroom for science supplies to be drawn on by a particular class as needed. Things that are needed by a class in a study of machines, for example, can be obtained from a central source. Also, things brought in from outside like wheels and pulleys can sometimes be left to be used by other classes. The sharing becomes a two-way path. Material is borrowed from the storeplace; often it is returned with dividends.

By using such an approach to science problems, very rich experiences may be had by a group. Many experiments and demonstrations can be carried out; the reports can be more complete.

Since the emphasis in elementary science is on experimentation, a large and varied background is usually required before children see the need for "trying it out." We are fortunate in having several text series from first through eighth grade in elementary science that emphasize an experimental and problem solving approach. Naturally, each series has its strong and weak points. By using all of them as needed, a balanced picture, with proper materials for all maturity levels may be obtained.

Written materials need not be the sole resource for elementary science. Frequently, in a given school, there are youngsters with particular talents in certain science areas. Usually, these youngsters will be very happy to share their specialized knowledge with other children. While this procedure often means that an upper grade child will assist a lower grade group, there are times when a second grader's special knowledge of, say, electricity can be utilized by a fourth grade. Besides the science values gained by using school children as resource people, the social progress of individual children by using this method is often encouraged.

Adults, Too, Are Resources

Sometimes adults in the community, if they are interested, make valuable contributions to science work in the schools. A third grade studying fire, the fire department, causes of fire, and fire safety realized that they could gain much pertinent information if they could ask the local firemen. They planned their work so carefully and worded their questions so well that in answer to their queries, one fireman came to the school on his own time to help them out.

Many adults will respond to calls of assistance from the school if they are convinced that the children have studied their area, and their questions are based on genuine interest. Adults who become associated with the school in this manner often serve as interpreters of the school program to other people.

Films and filmstrips are also excellent resource material if used well. Too often there is so much content in one ten-minute film that children cannot grasp all the important ideas. We have found films to be valuable when preceded by a great deal of work in the area covered by the film. Filmstrips are more adaptable, perhaps, for use near the start of work in a particular area.

Summary

If science is to be learned effectively by children at the elementary school level, they need many and varied resource materials. Children must probe and experiment on their own if they are to grow in the ability to solve problems. Only in an atmosphere rich in resources and at the level of the researcher can this ability be developed. The methods described in this article have all proved effective in aiding the growth of youngsters in science in the Great Neck schools. It is thought that they might be used elsewhere with equal success.

Science Night in Cambridge

By W. J. TROY

Ordinarily, one would describe Cambridge, New York, as a "small, quiet, rural community." Situated in the foothills of the Green Mountains, it has a population of approximately 1600, and serves a predominantly rural territory. Its streets are normally quiet, and the makeup of its citizens includes a "touch of New England."

But one night last spring Cambridge became a hub of activity. Cars, buses, and trucks from as far away as Arlington, Bennington, and Huntington, Vermont, and Schenectady, New York, streamed into town.

There was a reason for this activity. It was "Science Night" in Cambridge. Over 1300 people filed into the spanking new Cambridge Central School to see a relatively new idea—General Electric people and community citizens co-operating to make science a more fascinating form of entertainment. They had come to watch demonstrations of science exhibits prepared by students of Cambridge, Bennington, and Arlington High Schools; to see a science play presented by Cambridge pupils; and to watch the General Electric "House of Magic" show.

On this "Science Night," as the guests entered the school, they were directed to the exhibits which were set up in halls and classrooms, and were given demonstrations by the student exhibitors. The students also explained how their demonstrations worked and answered questions concerning their projects.

Making the spots on the disc appear to stand still while the disc is turning at several hundred RPM's is one of the most outstanding feats of the "House of Magic" show. William A. Gluesing, General Electric engineer, uses a stroboscope lamp to achieve the effect.

One of the most unusual exhibits was a miniature volcano made by 14-year-old Garret Albert of Cambridge. Inside a realistically painted model volcano, constructed of plaster of Paris, Garret placed two chemicals, glycerin and potassium permanganate. In 15 seconds rapid oxidation caused smoke and flame to pour out through the top, simulating an actual eruption.

Another interesting exhibit, demonstrated by 8th-grader Robert Wright of Cambridge, was an insulation display. Robert had constructed three small, identical cardboard houses. The inside of the first had bare walls and ceiling. In the second, aluminum foil had been used to cover the walls and ceiling; and in the third, rock wool and aluminum foil. Inside each house a 15-watt electric lamp bulb was burning, and through the roof of each a thermometer had been inserted. The first house had a very low inside temperature, indicating that most of the heat was escaping. In the second, the temperature was higher, and, in the house with rock wool and aluminum foil insulation the temperature was very high. This showed that most of the heat generated by the lamp remained in the house. Robert would say to this, "You see, the better the insulation, the more heat you can keep in your house."

One of the most startling exhibits was the "iodine clock" demonstration given by Peter McCabe and Stephen Congdon of Arlington, Vermont. Using an alarm clock for measuring time, the boys took two clear liquids and mixed them in a beaker. In one minute from the time they were poured together they turned from a colorless liquid to a dark blue. This was done, Peter explained, by "taking 400 milliliters of water, and adding to it 42 milliliters of N_2SO_3 solution and 60 milliliters of a starch solution. To this was added 42 milliliters of KIO_3 solution. At 20° C. the liquid will change color in exactly one minute."

The concluding feature of Cambridge's first "Science Night" program was the presentation of General Electric's widely-known "House of Magic" show. The Company lecturer, Wray Reger, demonstrated to a fascinated audience how he could shake

hands with his own shadow, using a phosphorescent screen and a brilliant photo lamp; and with stroboscopic lights, how it is possible to study rapidly moving objects as if they are standing still. The stunt which captivated the audience, however, was the exploding paper disc demonstration. A paper disc was attached to the shaft of a small motor, and as the motor whirled the disc up to 10,000 revolutions per minute, the audience waited breathlessly. As the paper reached a speed at which it could no longer stand the strain, and with a loud report burst into many pieces, parents and students, alike, nearly jumped from the seats.

Much of the success of Cambridge's "Science Night" was due to the efforts of the science instructor, Kenneth R. Wilbur, and the school science club. There are only 13 students in the club, but they did everything from making exhibits to acting in the science skit. A typical example was Robert Isaksen. Bob displayed two exhibits, had a leading part in the skit, and presented entry certificates to the student exhibitors at the close of the program.

Garret Albert places the proper chemicals inside his miniature volcano. When the reaction takes place, flame and smoke spew forth from the foam.

Organized less than a year ago by Mr. Wilbur, the science club has already become an important part of the school's science curriculum. Prospective applicants are taken into the club on a three-week probationary period, during which time they must show a serious interest in science. After their probationary period they are voted on, and must receive a unanimous vote to become members.

While a member of the organization, each student must carry on a yearly science project. "The club meets each day, after school, for an hour and a half, and uses that time to work on its projects," explains Mr. Wilbur. One of the most interesting of these is the white rat research on which Bob Isaksen is working. Bob is performing a nutrition experiment, feeding half his rats a diet containing a viosterol (source of vitamin D), and the other half a diet without vitamin D. "I plan on writing my conclusions on differences in growth, deficiencies, actions, and abilities between the two groups from graph records and observations I make," says Bob.

That the efforts of the science club, and other participating groups, had resulted in success were plainly evident. Said one student, after the "Science Night" program was over, "This is the biggest and best thing that has happened in this town for a long time." And from the happy expressions on people's faces as they left the school that night, it was apparent they thought so, too.

Mr. W. J. Troy is in charge of science demonstrations for the General Electric Company. He recently wrote to us, "During the past year, in cooperation with the science teachers in several schools in Atlanta, Georgia, and in Schenectady, Utica, and Cambridge, New York, the General Electric Company has presented 'Science Nights.' These science programs have combined student exhibits and demonstrations with G-E's 'House of Magic' science show.

"Although the idea of 'Science Nights' is still new, its several 'test' programs have been warmly received by school faculties, students, and parents. It would seem that other science teachers might like to know of the program."

Here, in words and pictures, is Mr. Troy's report of the Cambridge, New York, "Science Night." If you are interested in the possibility of staging such a "Science Night" in your school or community, you are invited to write to "House of Magic," General Electric Company, Schenectady 5, New York.

Children look astounded and students gape in amazement as Wray Reger, "House of Magic" lecturer, shakes hands with his own shadow.

A Professional Relations Announcement

Chemical Companies Plan Aid To School Guidance Programs

SCHOOLS throughout the country can look to local chemical companies for more assistance on student guidance activities and education-industry projects in general. Anxious to attract qualified young people to careers in chemistry and chemical engineering, the Manufacturing Chemists' Association has provided all member companies with a booklet containing sound advice on how to work with schools. Primary purpose is to reach teachers and students in plant community schools with information about the nation's need for scientific manpower and about the job opportunities in the industry.

The booklet suggests various company projects which may be of educational value from the teacher's standpoint and also create a better understanding of the chemical field. But, says the preface, "for all activities, school cooperation in planning and execution should be actively sought."

Plant visits are recommended, but with emphasis on the fact that teachers and students have found many such visits ineffective and dull. A few of the tips offered for improving them are:

Break student groups into small units.
Use first-rate men for guides, not necessarily *technical* experts.
Relate plant processes to something the student knows.
Make employees' role clear in each operation.
Provide for some form of group participation.
Brief visitors beforehand; summarize afterward.
Have a question period.
Don't walk people's feet off.

If schools are interested in having speakers from the local chemical plant, these speakers are urged to make use of such visual aids as the teacher approves and to employ the discussion method where possible. Inspirational talks on the "romance of chemistry" are not ruled out, but the need for specific information on types of jobs, training required, salary levels, chances for advancement, etc. is stressed.

The booklet assigns great importance to follow-up on plant visits and classroom talks, particularly by inviting students to the plant for personal talks with members of the company. It suggests that professional chemists should be on call the year 'round for informal discussions with interested young scientists in the schools. "In this way," says the booklet, "friendly relationships can be built up and the student's career genuinely guided and assisted in terms of his particular desires and abilities."

Summer or part-time employment—as local labor laws and union rules permit—is set forth as an excellent way for students to earn and learn at the same time. From the company's point of view, the booklet observes that such jobs "should be regarded as an investment in vocational guidance rather than a means of filling immediate personnel requirements."

Other suggested ways of helping student and teacher find out about career opportunities include distribution of literature on the subject, providing material for school library exhibits, and inviting school publication editors to "write up" some of the local plants. Essay contests are mentioned in passing, with the warning that many schools have seen too many of them already.

Where a number of chemical companies are all grouped in the same general locality, the booklet recommends formation of an "area industry committee." Such a committee has the advantage of providing area schools with a single clearing house for obtaining information, requesting speakers, or arranging plant visits to cover a variety of industrial operations.

Of interest to educators will be the three general rules set forth in the section called "Approaching The Schools:"

"Work through official school channels. In schools as in industry, people will appreciate your using proper channels of communication. . . ."

"Regard the teacher as a professional equal. . . . He (or she) is no more receptive than the next man to any form of paternalism or pressure."

And, amplifying the idea of seeking the help of educators in the planning stage, "teachers know what students need, and how it can best be presented to them. Teachers may not appreciate being handed an end product in which they have had no voice."

The Place of the Demonstration In Health Education

By JAMES H. HUMPHREY
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WITHIN the past several years educators have become ever more concerned with the relative value of the various methods of subject matter presentation. The textbook recitation method, the contract plan, the laboratory method and others together with their various combinations and ramifications, have all been discussed as to effectiveness, and are still in the constant process of revision by educators, teachers, and supervisors.

There has long been a controversy regarding the individual laboratory and the lecture demonstration in the field of science. Therefore, it should be pointed out here that it is not the purpose of this paper to discuss the demonstration as a general or specific method, but rather to think of it in terms of its possibilities as an intermediate method in the area of health instruction.

If the most effective learning takes place in those situations which bring into play several of the senses whereby the learner has a greater range of stimuli, then perhaps the well-executed demonstration might well be a very effective method in the area of health instruction. This does not mean to imply that the demonstration should be used to teach all of the lessons of a course. However, it should perhaps be considered as an intermediate method to be used in certain situations.

Miller and Blaydes [1] in discussing the use of the demonstration state:

> Demonstrations are most frequently given to a class as an illustration of something already learned. This may be a legitimate usage but it is one of the less important. A demonstration should do much more than this. It should appear to the student as a challenge to his skill in the use of what he may have learned already or as a stimulus in his search for new knowledge. It should give meaning to the effort that he is to put forth, causing him to feel that he is working for the solution of something that he may achieve.

In applying the goal psychology, that is, if all learning takes place with reference to a goal, the above statement with regard to the demonstration is indeed well founded. In this connection, it will be the purpose here to consider the possibilities of the demonstration in health instruction in relation to the introductory phase of the teaching-learning cycle.

Billett [2] has described a valid teaching-learning cycle as consisting of the following four phases: (1) introductory phase, (2) laboratory phase, (3) pooling-of-experience phase, and (4) estimating educative growth phase. He maintains that the introductory phase has been wholly successful if (1) the pupil's needs with respect to the unit have been learned, and (2) the pupil has been challenged by some question, some standard to be achieved, or some problem.

If the demonstration is to be used successfully in introducing a specific unit in health, then it is imperative that the demonstration be designed so that it will serve the purpose of the introductory phase of the teaching-learning cycle. It should be of such a nature that it will raise problems in the minds of the pupils and at the same time it should be closely related to the core activities of the unit under consideration. In using the demonstration as a means of introducing a specific unit in health, there are certain fundamentals which must be considered if the demonstration is to fully serve the purpose for which it is intended.

It is of primary importance that the demonstration be successful. If it is not successful there is the possibility that the pupils may lose confidence and consequently there will be little of a tangible nature to stimulate thought, thereby defeating the purpose of the demonstration as an introductory activity. If the demonstration is to be successful it is highly important that the instructor provide for adequate preparation. This might imply that the instructor might rehearse the demonstration to make certain that all details are in order. As a means of

[1] David F. Miller and Glenn W. Blaydes, *Methods and Materials for Teaching Biological Sciences*, New York: McGraw-Hill 1938, p. 47.

[2] Roy O. Billett, *Fundamentals of Secondary School Teaching*, Boston: Houghton-Mifflin 1940, p. 599.

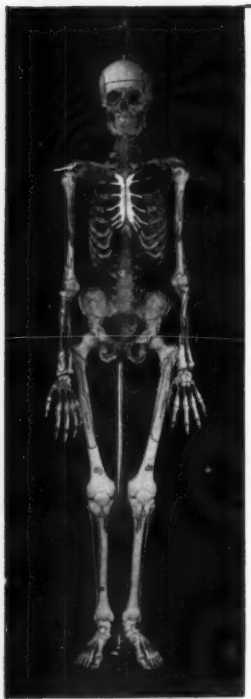
conserving time it is extremely important that all equipment used in the demonstration be arranged before the class arrives. Equally important is the fact that the equipment should be of such size and placed in such a position that all persons in the class will be able to see the demonstration under as comfortable conditions as possible.

Since "it is not the purpose of the introductory phase to impart to the pupils the whole of the learning product which is the unit," [3] the demonstration as an introductory activity in the teaching-learning cycle should be as simple and speedy as possible. In the use of a long drawn out demonstration the teacher may run the risk of "overselling" the entire unit by leading the pupils to expect too much from the subsequent phases of the teaching-learning cycle. If this happens the demonstration will not fulfill its purpose as a means of providing for problem solving situations. However, a well-planned and well-executed demonstration need not be a time consuming device in order to accomplish its objective as an introductory activity in the teaching-learning cycle.

If the demonstration is adequately carried out, it may set the stage for successfully accomplishing the three additional phases of the teaching-learning cycle. At any rate the demonstration in many instances would seem to be far more effective as an introductory activity than the "read it and recite it" method, which incidentally, may account for the lack of interest in health instruction on the part of many pupils.

Naturally, the demonstration should not be recommended as a universal device as far as the introductory phase of the teaching-learning cycle is concerned. Other good teaching-learning activities such as exhibits, field trips, audio-visual aids, or discussions have their place in the introductory phase, and should be utilized when adaptable to the particular situation. However, in view of the fact that the demonstration has a wide range of application in the area of health instruction, its consideration as a worthwhile and effective teaching device is indeed warranted.

[3] *Ibid.* p. 600.



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NO POWER

A Playlet for Upper Elementary or Junior High Pupils

By GRACE B. COFFIN

Teacher of General Science, Fifth Street Junior High School
Bangor, Maine

Characters: Mother; father; Kathy, high school age; Jerry, aged 12; baby Sue.

Scene: Mother and children are in the dining room. Mother is ironing. Kathy has books spread on the table, a pencil in her hand, and is reading and making notes. Jerry, at the other side of the table, is gluing together a model airplane. Baby Sue is on the floor with blocks and a doll.

Jerry: "Mom, you know what Miss Lambert said at school today? She said —"

Kathy: "Jerry, don't talk so much. I've got half a book of history to read tonight, and I can't remember a thing when you talk all the time."

Mother: "Half a book, dear? That seems a lot for one night. Have you been letting it slide so that you have it all to do at once?"

Kathy: "Well, maybe it isn't half the book, but it's this much, and we have to turn in an outline and take a test on it tomorrow and . . ."

Lights suddenly go out. (Leave dim glow so characters can be seen). All exclaim, "Gee whiz!" "What's gone wrong?" "For goodness' sake."

Mother: "Wait a minute. Don't try to do anything yet. Sometimes the power comes back on again in a minute or two.

They all wait. Subdued, general conversation.

Jerry: "I guess it isn't going to this time."

Mother: "No, I guess it isn't." *(Jerry starts to get up.)* "Now Jerry, stay where you are. If you go stumbling around in the dark you'll fall or break something, or maybe step on the baby."

Baby sets up a wail. Mother pats the first thing she happens to reach, which is baby's nose.

Mother: "Don't cry, Sue honey. We'll have a light in a minute. Let me see—where did I put that candle? There was one here on the shelf I believe."

Mother shuffles and feels her way to the shelf. Feels about for the candle, and then for matches.

Kathy: "Can't you find the candle, Mother? I think I know where it is." *(She starts up.)*

Mother: "Oh, I have the candle; never mind." *(Still feeling about.)*

Jerry: "Why don't you light it then?"

Mother: "I can't find any matches. When I don't want them the house is cluttered with match books, and now I can't find one. I'll have to go out in the kitchen. I'm sure there must be some there."

Kathy (fumbling on the table): "No, wait; here's a book of them on the table. I'll light one."

Jerry: "Well, hurry up, will you? I'd like to see what I'm doing here; the glue will all be dry."

Kathy lights one match and starts slowly across the room to meet Mother who is bringing the candle. Kathy stumbles, says "Ouch!" The match goes out.

Mother: "What did you step on, dear?"

Kathy: "One of Sue's blocks, I guess. Something on the floor, anyway."

They finally get the candle lighted.

Mother: "There, put it on the table. We can't see much, but at least we won't fall over the furniture."

Jerry: "Hey, what did you drop that hot wax on me for? Don't you know how to hold a candle straight?"

Kathy: "Oh, I'm sorry. Never mind; there it is now."

Mother: "I wonder whether I can see enough to finish this ironing before supper. It was almost done." *(Picks up iron.)* "Oh, of course I can't. The power is off in the iron, too. Well, let me see. There

were some rips to mend in these clothes I just ironed. Maybe I could fix those."

Kathy: "Not unless you want to sew them up by hand, Mom. The electric sewing machine isn't going to work either, you know."

Mother: "That's right, too. There isn't much I can do, is there? I'll just have to wait a while." *(Sits down.)* "Come here, Sue. Want to sit with Mommy a while?" *(Baby climbs in chair with Mother.)* "I do hope we have the power back on by morning. I got out a big pile of blankets today that I planned to wash tomorrow."

Jerry: "Say, I just thought of something! What'll we have for supper if you can't use the electric stove? I'm hungry."

Kathy: "Oh, you're always hungry."

Mother: "We can't have a hot supper if the power doesn't come back. All I can think of is sandwiches and milk. Sue won't like cold milk, either. Maybe the hot water in the tank is hot enough to warm the bottle for her."

Jerry: "I want peanut butter sandwiches with jelly."

Mother: "You can have the peanut butter. The jelly is in the preserve closet down in the cellar. If we can find some more candles maybe I can go down and get it for you."

Kathy: "Mom, if the refrigerator doesn't work, will the milk sour and all the food spoil?"

Mother: "Not right away, dear. It will keep cold for a few hours, perhaps till tomorrow. I am more worried about all the food in the deep freeze. But the man who sold it to us said that it would be safe for at least twenty-four hours, and the power certainly should come back on before that time."

Kathy: "Seems to me it's getting cold enough to freeze food right here. I thought we burned oil. Don't tell me the power shuts off the heat, too."

Mother: "Oh, I hadn't thought of that. The oil furnace can't work without its electric controls. Get your sweaters, and see if you can find Sue's, too."

There is a great deal of feeling on chairs, and moving the candle around. Finally, one at a time, the sweaters are all put on.

Mother: "Father will help us start a fire in the fireplace when he comes. It's almost time for him now." *(Looks at clock.)* "That's stopped, too, of course. Kathy, dear, don't try to read by that candlelight. That's too much to expect of your eyes."

Kathy: "But Mother, I've got to get this homework done tonight somehow."

Jerry: "Let it go; you'll have a good excuse. I can't see where to put the glue on this thing, and I promised John I'd finish it tonight so we can shellac it tomorrow. Gee, did people really live with no more light than this in the old days? I don't see how they ever got anything done."

Mother: "I suppose their fires in the big open fireplaces gave some light. But probably they didn't try to do too much work after dark. They must have gone to bed early and got up early to get their work done. I know my grandmother used to think we were terribly lazy if we weren't up by sunrise all the year 'round. Of course we never were, except in winter; but that's what she thought."

Jerry: "I'm glad I didn't live then. Hey, here's Dad."

Father: "Hi, everybody! I was just talking with Frank Johnson. You know he is foreman of the repair crew for the power company. They are working down at the corner of Maple Avenue and he says they are almost through."

Kathy: "What happened at the corner to cut off the power?"

Father: "A man was driving too fast, I guess, and hit the pole at the corner. The pole was broken off and some of the wires snapped and were hanging down into the street."

Jerry: "What happened to the man?"

Father: "Well, he wasn't killed, but he and his wife were both taken to the hospital. The car is still upside down on the Kirby's lawn."

Mother: "Oh dear; why will people do such foolish things?"

Lights come on. All exclaim.

Kathy: "I never realized how much difference electricity makes."

Jerry: "Yeah, I'm glad we don't lose our power very often. Good old electricity!" *(He salutes the light.)*

Curtain.

SCIENCE TEACHERS WIN AWARDS

"WASHINGTON, D. C. (Special) Seventeen science teachers have been selected to receive cash awards of fifty dollars each for their entries in a 'best teaching ideas' contest sponsored by the American Society for Metals. The contest was conducted by the National Science Teachers Association as an activity of its Future Scientists of America Foundation program. The purpose of this program is to help stimulate more boys and girls to study science with a view to entering upon careers in science, engineering, and technical fields.

"The teachers' contest was designed to obtain reports of the best ideas and most effective ways of working with students, individually and in small groups. The best of their reports are soon to be published in a booklet which will be widely distributed to other science teachers throughout the country.

"William H. Eisenman, secretary of the American Society for Metals, said in announcing his Society's sponsorship of the awards program, 'We are happy to give our support to efforts to increase the quantity and the quality of scientific manpower for the future. If we can help science teachers do a better job and help more students realize the importance of engineering and the opportunities it offers, we will have accomplished our purpose. We hope that more students will see how essential it is to take math, chemistry, and physics in high school so that they can enter engineering schools without having to make up some science subjects which should have been covered in their high school careers. This country needs more engineers to maintain its rate of progress and its position in the world; metallurgy, which is the largest employer of engineers, needs more engineers.'

"The National Science Teachers Association is the largest organization of its kind in the world. It is an affiliate of the American Association for the Advancement of Science and a department of the National Education Association, where its offices are located in Washington, D. C."

SOME such news release as that suggested above will soon go out on a nation-wide basis. And with the writing and mailing of checks to the winners of awards, the 1952 awards program for teachers will close—except that through the publication of the reports, partly in the pages of *The Science Teacher* and in the booklet still to be prepared, a chain reaction of reading, adapting, and using good ideas is expected to result.

Fifty-seven entries were received; not a large number in the absolute, but a satisfactory response in view of the short time available to prepare and submit reports. Judging of the entries was done by members of the same committee that judged the student entries (see September issue of *The Science Teacher*), except that Dr. Morgen of the National Science Foundation was unable to participate. All of the judges read all of the entries and assigned independent ratings. All of the ratings were added together and then averaged as the main step in selecting awards winners. Questions and cases of doubt or close agreement in average rating were discussed by the entire group of judges.

The seventeen winning papers came from teachers located in ten different states. All sections of the country were represented. The judges also agreed upon six additional papers as deserving Honorable Mention. These came from among the same states that provided awards papers.

The judges had high praise for the idea behind this awards program and for the high quality of the papers submitted. As one judge remarked in the midst of reading one of the entries, "By Gee! You know, there is a *whale* of a lot of *good* science teaching going on in this country." Chief criticism was the feeling that a few of the entries had been rather hurriedly prepared, resulting in papers considerably below the teachers' abilities. On the other hand, most of the papers showed great care in preparation; they were neatly typed, well illustrated with photographs and drawings, and firmly bound in attractive folders or covers, and they made a deep impression on the reader.

The following listing gives the names of the teachers who were selected for awards (indicated by *A*) and Honorable Mention (indicated by *HM*), together with their schools and teaching positions, the title of each entry, and a brief statement describing the nature of the entry.

BRANDWEIN, PAUL F. (*A*) Chairman, Science Department, Forest Hills (N. Y.) High School. "The Selection and Training of Future Scientists." A plan for working with capable students desiring to concentrate in science at the high school level. Argued as educationally sound because "The facts are that such concentration can occur on the same basis that students concentrate on art, or music, or athletics, or drama, without a loss of the educational benefits of a general and exploratory nature which fall within the purvey of secondary education."

COOPER, BELLE. (*A*) Science Teacher, North Fulton High School, Atlanta, Georgia. "The North Fulton Science Fair." A report of the careful, step-by-step planning and conduct of a successful science fair. Reported by Miss Cooper for all the school's science teachers, including also Richard N. Jones, Paul Guptil, W. Taft Sutton, Emily Harville, Christine Minnix, and Fred Russell.

EDSON, MITCHELL. (*A*) Student Teacher, Forest Hills (N. Y.) High School. "A Class in Individual Science Research as a Factor in Stimulating Creativeness." Describes a plan by which a class of thirty students work individually on science problems of their own choosing. They have freedom in terms of time and thinking to do their own library work, laboratory work, obtaining materials needed, making mistakes, etc. The instructor serves as "resource guide" rather than *teacher*.

EILERS, IRMGARD. (*A*) Teacher of Science and Mathmatics, Grades 5-8, Walt Whitman School, New York City. "A Housewarming in Conservation Valley." Describes an activity for elementary school children in which conservation and related science were involved through the building of a diorama, Cottage Community in Conservation Valley.

ESSIG, RUTH. (*A*) Instructor in Methods of Teaching Elementary Science, University of California at Los Angeles (Extension), Inglewood, California. "Fun With Science" and "Wonder Experiments for Children." In words and drawings, suggestions are provided for teachers on how to provide science experiences for children and how to discuss the results in a meaningful way. Correlations with commonly-used textbooks are included.

GETTY, JAMES H. (*A*) Teacher of Eighth Grade Science, Bala-Cynwyd (Pa.) Junior High School. "The Individual Project Method in My Science Class" and "My Student Winners in the Annual Greater Philadelphia Science Fair." Tells how this teacher works with pupils of all ranges of abilities on an individual basis and how science fair winners result from such an approach. Many accounts of actual classroom problems and situations; numerous photographic illustrations.

GILLARY, HERMAN. (*A*) Biology Teacher, Forest Hills (N. Y.) High School. "Individual Student Projects" and "My Classroom Is A Museum." Individual work is based on assumption that every student in the class has a potential for a career in science at some level. Gives specific instructions on how to initiate work based on this idea, how to encourage students, how to have a "presentation day" for showing students' work. Suggests how to have and use a classroom museum.

HOLLENBECK, IRENE. (*A*) Biology Teacher, Salem (Ore.) Senior High School. "The Unit Assignment in Biology" and "Biology Interest-Getting Devices." How to introduce "biology" to students and then engage in pupil-teacher planning in developing the "course." How to use interesting ways of helping students with vocabulary, nomenclature, and other technical aspects of the work. Illustrated with cartoon-type drawings and samples of worksheets used in class. Review of results on standard test shows students do learn "the fundamentals."

KLINGE, PAUL. (*A*) Biology Teacher, Thomas Carr Howe High School, Indianapolis, Indiana. "A Program for Identification and Encouragement of Science Talented Students." Outlines the science curriculum of this school, the science auxiliary service, co-curricular opportunities and activities, public relations activities of the science department, and future plans, topped off with an evaluation report based on five years of operation.

KRAUS, DAVID. (*A*) Science Teacher, Far Rockaway (N.Y.) High School. "Starting a Science Project Room." Describes a plan for giving talented and interested students an opportunity to do individual work, often on a research basis.

LESSER, MILTON S. (*HM*) Biology Teacher, Thomas Jefferson High School, Brooklyn, New York. "Adaptation of Instruction to Pupils' Individual Interests." Suggests practical ways to attain the goal of individualized instruction despite classes of 35 and over, five such classes a day, and additional duties for the teacher.

MACCURDY, ROBERT. (*A*) Biology Teacher, Watertown (Mass.) Senior High School. Mr. MacCurdy submitted numerous papers which he has written to outline the work he and his teaching colleagues carry on in working with all students in science and especially with the science talented group. Of special interest is an account of a Science Seminar Society for secondary schools.

MORHOLT, EVELYN. (*A*) Science Teacher, Forest Hills (N. Y.) High School. "A School Nature Museum." Describes a plan by which students have organized the Curators' Club to care for, further develop, and encourage better use of museum-type science teaching facilities.

PATTEE, S. M. (*A*) Science Teacher, Roosevelt High School, Cedar Rapids, Iowa. "Trees Along the Nature Trail at Roosevelt High School." A booklet prepared jointly by the biology, art, and English departments, and printed in the school printing shop. Names and describes the trees to be found along the school's nature trail (shown by a map included in the booklet). Other similar booklets prepared by the school's Biology Club include "The Amphibians of Linn County," "The Snakes of Linn County," and "The Evergreen Trees Around Our Schools."

RIPPEY, ROBERT M. (*HM*) Science Teacher, Howe Military School, Howe, Indiana. "Amateur Radio at Howe School." Tells of the fun and learning developed through a radio club. The boys have built transmitters and receivers, a television set, a signal generator, power supplies, and other items. Four members have received licenses, and the school's amateur station has made fifty contacts with amateurs in other parts of the country.

SCHWABE, LOUISE and GLADIEUX, ROLLAND J. (*A*) Biology Teacher and Physics Teacher, respectively, Kenmore (N. Y.) Senior High School. "The Science Club Program of K. H. S." The Biology Club and the Physical Science Club meet each Thursday evening at 7:30 p. m. Individual or small group project work is emphasized. Individuals and industrial firms in the com-

(Please continue on page 244)

Amateur Radio at Howe School

By ROBERT M. RIPPEY

Howe Military School, Howe, Indiana

Editor's Note. This paper was given Honorable Mention in the 1952 Teacher Awards program of FSAF. The writer reviews his successful experiences with a club-type approach to building interest and stimulating activity in radio and electronics among students. This would seem to be a timely emphasis in science. The radio and electronics industries have expanded enormously in the past ten years. This subject is commonly touched on in general science at the ninth-grade level and in high school physics courses. However, probably much could be done to strengthen such instruction at both levels and to stimulate career thinking when students are eager to explore this fascinating field. One might even suggest that there is room for more semester or full-year courses in radio and electronics as such. In the 1948-49 U. S. Office of Education comprehensive survey of enrollments in high school subjects, courses in radio and electronics were offered in 27 states with 3248 students enrolled.

Amateur radio is fun. It is a key to new friends and a road to adventures in other parts of our country and the world. A friendly conversation with an amateur in London is a better guide to world understanding than a thirty-page abstract published by the UN. QSL cards exchanged by amateurs after each contact are fun to collect, and give added information about people and places far away. Along with the enjoyment and fascination of the hobby comes motivation for science and mathematics courses, increased knowledge of principles of electricity and radio, and valuable experience in communication techniques which will be of value to any student either in the armed forces, or in his search for a better career. These are some of the reasons why we started a radio club at Howe School.

We have had, since our beginnings a year ago, four main objectives: construction, earning licenses, learning about radio, and operating our amateur radio station. Members of the club have built a television set, a cathode-ray oscilloscope, a signal generator, and a transmitter from kits. Others have built power supplies and a select-object circuit working only from wiring diagrams. Others have designed and built their own transmitters and receivers. Four of us have received licenses already, and others are on their way. Club members are often called on to repair an ailing receiving set. Our amateur station has already made fifty contacts with amateurs in other parts of the country.

The organization of our club is loose structured and is based entirely upon interest. Cadets who receive their licenses help the beginners and I, as sponsor, help the more advanced students gain additional operating privileges.

Our instructional program is simple. Once each week we have a meeting which consists of a short lecture on radio theory and practice and a half-hour code practice session. During the rest of the week the radio room is open to any boy who has a free period and who is doing satisfactory academic work. Before using the transmitter the boys must get their licenses from the federal government and then pass the following test on using our own transmitter. The government examination for a novice license covers the applicant's ability to send and receive five words of code a minute.

Does it cost a fortune to start a radio club? Far from it. We started with nothing! Our first job was to canvass the neighborhood for discarded radios. Calls on several repair men proved helpful. We got about a hundred pounds of spare parts that way and they got rid of about five hundred pounds of junk. As interest increased the boys would buy a few pieces of equipment and leave it in the ham shack for the use of all. A donation from a friend of the club furnished our present fine transmitter and receiver; but we would have gone ahead just the same without them.

Transmitter Qualification Test

1. Describe the steps to be followed in putting the transmitter into use.

2. Diagram the front panel of the transmitter, label its parts and describe the function of each switch and dial.

3. Where might one come in contact with lethal voltages on the xmitter and how can you avoid such contact?

4. What is the maximum legal allowable plate current on the 807 for novice transmission?

5. Diagram the switch control panel, label each switch position and then indicate the switch positions for a. transmission b. receiving c. shutting down.

6. What must be the position of the cathode coil

switch at all times when broadcasting on 80 meters (xtal frequency)? What will happen if it is in the other position?

7. What would happen if the transmitter were to be used without an antenna?

8. What would be the effect of too small a C bias on the transmitting tubes? What must be done before transmission to make certain that the C bias is sufficient?

We were fortunately blessed in the beginning by having a fine room for our purpose. It was not too large and was well lighted. It would have been better if it had been on the top floor of our building, but by using a television transmission line to lead to our antenna, we solved the problem of power loss. One side of the room is our station where we have installed our Hallicrafters S40A receiver and a 50-watt Millen exciter-transmitter. Our furniture is simple: a few chairs, some army surplus mess tables, and a bookcase. Wall charts and maps were obtained from the Amateur Radio Relay League, Westinghouse Electric Corporation, and Sylvania Electric.

Our librarian has purchased some books about radio. Some of the best are published by the Amateur Radio Relay League and can be purchased from any large radio supply house. Some of the titles we have used with the best effect are *How to Become a Radio Amateur, How to Learn the Code,* and *The Radio Amateur's Handbook.*

In a year, our program has resulted in the acquisition of one general-class license, one technician's license, and four novice licenses. Four other boys are preparing to attempt the examination this summer. We also have many beginners who are eager to begin their training next year.

We started our club with nothing but a keen interest in radio. What I know about amateur radio I picked up along with the boys. Amateurs are all a friendly lot and will be only too glad to help a group of beginners. We are especially indebted to W9FEI in Angola, Indiana, for his help and encouragement.

We have had a lot of fun getting started. The activity of the club is increasing, and hardly a day goes by without a call being made with a new station. Our call letters are WN9SMT. How about giving us a quick call when YOU get YOUR station going?

Science Teachers Like to Learn

By ANNA EVELETH HOLMAN

Formerly Chairman of the Science Department, Winsor School
Boston, Massachusetts

Editor's note. The experiment which Miss Holman reports in this brief article is, we believe, sufficiently new and apparently successful to justify "passing it on" as an idea for consideration by other groups of science teachers. Miss Holman is a member of NSTA; she was also president of the Eastern Association of Physics Teachers, a member of the New England School Science Council, and of the Massachusetts Science Fair Committee. Miss Holman is now connected with the Pacific Oaks Friends School, Pasadena, California, and the Adult Extension Division of UCLA.

INDEED, science teachers *do* like to learn—provided they are offered what they want to learn and in a way that arouses their interest. Their case is the same as with their pupils.

The time and place are not the vital points, as a recent series of lectures given at the American Academy of Arts and Sciences in Boston shows. To that series came nearly a hundred science teachers—from public, private, and parochial schools—on four successive Tuesday school nights, some from as far as ninety miles away, in the New England weather of January and February.

The contention of the Eastern Association of Physics Teachers which, in cooperation with the American Academy of Arts and Sciences, sponsored this series was that teachers want a chance for contact with scientists on the front line of their various fields, a chance to learn directly from them and not merely through reading. If to that is added a chance to talk to the speaker personally and a chance to get to know each other, the occasion will fill a teacher's need and so serve the young scientists in his charge. In that case the teacher will overcome great inconvenience to attend.

The subject of the lecture series was "The Sun in the Service of Man." The four meetings of which it consisted were planned to cut across subject boundaries; together they offered an excellent example of the interrelation of the sciences on a general problem of human interest, as well as a convenient

opportunity for the presentation of some recent developments. They were held on four successive Tuesday evenings from 5:00 to 9:00 p.m., at the House of the Academy. After an hour lecture there was a break for group suppers at nearby restaurants. Then the entire group reassembled for an hour of questions, discussion, exchange of teacher experience, and personal contact with the speaker.

The speakers were eminent workers in their fields as well as masterful and enthusiastic expounders. The success of the enterprise shows the time and interest they contributed.

The first meeting, "The Sun in Action," was given by Donald H. Menzel, Professor of Astrophysics and Associate Director for Solar Research in the Harvard College Observatory. He spoke on what we know about the sun and the dependence of all life on solar energy; the sun's effect on the earth's magnetic field; on radio transmission; on the aurora borealis. In addition he showed the impressive film, "Explosions on the Sun," made at the High Altitude Observatory of the University of Colorado and Harvard University.

The second lecture, "The Reaction of the Lower Atmosphere to Solar Variation," was given by Hurd C. Willett, Professor of Meteorology at the Massachusetts Institute of Technology. He spoke of the earth's heat balance, dealing with solar heating and losses and the resulting vertical and latitudinal transport of air which is the cause of weather. He paid particular attention to long-term weather variations and to the present theories to account for irregular solar variations.

At the third meeting, Kenneth V. Thimann, Professor of Biology and Vice-Chairman of the Institute for Research in Experimental and Applied Botany at Harvard University, presented "Photosynthesis: the Biological Conversion of Solar Energy to Chemical Energy." Among other recent advances he described in detail experiments made during the last six years in which the "dark reaction" of photosynthesis, or a very similar process, has been achieved outside the cell.

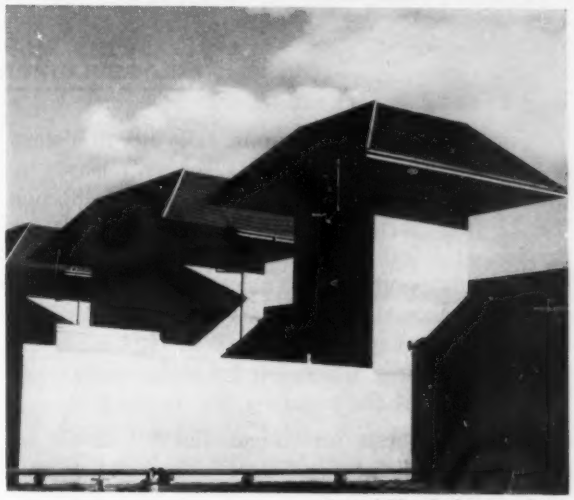
For the last meeting Kirtley F. Mather, Professor of Geology and Curator of the Geology Museum at Harvard University, discussed "Society's Management of Incoming and Stored Solar Energy." This brought to a well-rounded close the consideration of solar energy from its source to natural and man-controlled capture.

As has been indicated, those attending came from a surprisingly large area geographically. Their scientific backgrounds were varied. They came from all types of institutions. A few teachers brought some of their intensely science-interested pupils to the whole series. In their replies to a final questionnaire the teachers showed an almost unanimous approval of the series and expressed their satisfaction with the return made on the effort and time they had invested in attending. "The speakers were excellent in every way. They were right within the scope of J. Q. P. and presented their subjects so everyone in the audience got something out of it. If it were possible I would attend a similar series next year." "This is the most enjoyable series of science lectures I've attended."

Teachers need and like to know so much more than they teach. They thrill with the exciting refreshment that comes from leaving their all too well beaten track and moving, if only for a short distance, down new paths.

As a result of this experiment a similar series on the same level is being planned for the coming year. If groups of science teachers in other regions should try such a series for themselves, an exchange of experiences might prove valuable.

What Is It?



General Electric Company Photo

These massive concrete structures are test cell air intakes for production jet engines on test at General Electric Company's Lockland, Ohio, jet center. Air rushes to the engines in the test cells beneath at approximately 100 miles per hour. When the air leaves an engine, it is traveling at 1300 to 2000 miles per hour. Design of the cells and their exhaust stacks (not shown) "greatly reduces the sound levels of engines being tested," according to company engineers.

PRECIPITATES

Announcements, News, and Views of Current Interest

"SUGAR U.S.A.", a 28-minute, full color film story of the sugar beet industry, has just been released by the Western Beet Sugar Producers, Inc., through the 27 film libraries of Modern Talking Picture Service. It is offered to schools, colleges, and all types of adult audiences at no cost other than transportation. Animated sequences explain modern refining steps, and episodes in research kitchens reveal testing procedures responsible for maintaining quality standards of the sugar.

Booking requests for "Sugar U.S.A." should be addressed to Modern Talking Picture Service Inc., 45 Rockefeller Plaza, New York 20, New York.

FOR THOSE OF YOU who are interested in tape recording, take note of the new educational applications of the Synchrotine. The device permits the recording of two different sound events on the same tape. Further details on application may be obtained from Magnetic Recording Industries, 30 Broad Street, New York 4, New York.

DEIONIZED WATER equal to triple distillation can now be made by a new portable device called "Deeminac." Tap water, a polyethylene bottle, and resin filter will produce up to 20 gallons of chemically pure water with this device. Descriptive literature available from E. Machlett & Son, 220 East 23rd Street, New York 10, New York.

EDUCATORS PROGRESS SERVICE, Randolph, Wisconsin, announces the 12th Annual Edition of the *Educators Guide To Free Films*—508 page edition of 2332 titles. Significant features are the color indexes of title, subject, sources, and availability; omission of films under controlled distribution; starring of new titles. Price $6.00. Reprints of *The Sponsored Film in General Education,* by the educational consultant, Dr. John Guy Fowlkes, are free upon request.

COLLEGE LEARNING AND TEACHING by Ray H. Simpson and E. S. Brown reports the results of a rather unusual study in education. An attempt was made to measure the learning being practiced in eight institutions of higher education. University of Illinois Bulletin, Volume 49, Number 75; June, 1952.

GENERAL MOTORS continues to add to its free circulating library of 16mm sound films. The new film catalogue complete with classified listing, descriptions, and convenient order blanks can be obtained by writing General Motors, Department of Public Relations, Film Section, Detroit 2, Michigan.

A 1952 EDITION of "The Oil Producing Industry in Your State" is available from the Independent Petroleum Association of America on request. The only "state by state" reference of its kind, it traces geographical extent and economic contributions of the petroleum industry from the first recorded production to the present day. IPAA Information Service, P. O. Box 1019, Tulsa, Oklahoma.

TEAMING UP FOR PUBLIC RELATIONS, a handbook for leaders in American education, is the result of a recent conference of 300 leaders in education. It gives recommendations for preservice and inservice public relations preparation for classroom teachers and school administrators, suggests ways in which specific groups and agencies can perform these tasks, and provides a guide to resource materials which will be useful to every person interested in building understanding and cooperation for the public schools. Single copies $1.00. Quantity orders at discount. Order from the National School Public Relations Association, 1201 Sixteenth Street, N. W., Washington 6, D. C.

TEACHERS OF EARTH SCIENCE will be interested in *The Educational Leaflet Series* from Ohio State University. The leaflets now available are "The Search For Uranium" and "Who Was Who In The Ice Age." For further information on this free background material correlated with geological museum exhibits, consult the Museum Curator, Geological Museum, Ohio State University, Columbus 10, Ohio.

OCCUPATIONAL OPPORTUNITIES for earth scientists are great according to a report recently issued by the Bureau of Labor Statistics. U. S. Department of Labor, Washington, D. C. Free copies of the occupational outlook summary and wall chart are available to teachers on request. Copies of the Bureau's 38-page illustrated Bulletin No. 1050 are available at 30¢ per copy. This will be of interest to future geologists, geophysicists, geographers, oceanographers, meteorologists.

Please mention THE SCIENCE TEACHER when you write.

Goin' Fishin' -- *For Scientists and Engineers*

By ROBERT D. MAC CURDY

Much has been said and written recently about the current and future shortages of scientists and engineers. Even after making allowances for differences in various estimates of the magnitude of the shortage, it is quite apparent—we must have more. Dr. Arthur Compton has said, "Engineers and scientists under present world conditions provide technical strength for protection against those who could destroy our free way of life. We must sharpen the spear that we hold in one hand while we apply the trowel with the other."

It seems safe to make two basic assumptions that are somewhat validated by recent publications. (1) Science and engineering talent shows up in students early in their high school years. (2) Science teachers in the junior and senior high schools can recognize and help to develop this talent. If these are correct assumptions, then those of us who work with high school youth may properly ask of representatives of industry—who, in the long run, are the principal buyers of this talent—the following questions when they ask for more men trained in science and engineering:

1. Do you visit scholastic science fairs and congresses and awaken the interest of your own company (and of your competitors) in following potential scientists by one or more of these methods?

a. Giving "sales talks" to individuals or small groups of the students.

b. Encouraging tours and visits to your plant.

c. Offering vacation jobs to some of the students.

d. Offering part-time jobs to some of the students during the school year.

e. Providing letters of appointment upon graduation for job interviews.

f. Writing letters to some of the students from time to time, just to "keep in touch."

g. Presenting trophies, prizes, and awards to students and schools in recognition of outstanding achievement.

2. Do you provide a "pat on the back" and encouragement for the stimulators (the teachers) of these future scientists by any of these methods?

a. Providing suitable recognition awards.

b. Encouraging trips to your plant.

c. Making summer vacation jobs available.

d. Offering summer time scholarships for further study.

e. Assisting in improving teaching equipment and classroom supplies.

f. Offering to send expert scientists to speak to science classes, clubs, and at "career day" assemblies.

g. Publishing their articles and articles about them in your house organ.

h. Helping to underwrite the costs of science fairs, congresses, and similar programs of student encouragement.

i. Arranging for workshop study groups at your plant for teachers and representatives of industry to get together and study common problems.

j. Develop a mailing list of interested science teachers.

k. Employ retired teachers to help improve your public relations with schools.

l. Conduct surveys to discover and recognize the good science teachers, departments, and schools.

m. Publish lists of available science equipment and teaching aids and lists of fellowships, loans, and awards for teachers and students.

n. Put science teachers on some of your company committees to serve as special advisors.

o. Finance sabbatical leaves for the most outstanding science teachers for purposes of travel, study, and helping service to others.

p. Establish research grants for work in science and engineering education.

3. Do you show yourself and your company in a good light in the community?

a. By encouraging your people to take part in local programs and to serve on related school committees.

What with NSTA's Future Scientists of America Foundation program moving into full swing, it is very much in order to consider Mr. MacCurdy's suggestions for working with industry as we strive to develop "more scientists for research, engineering, teaching, and technician work." He presented some of these ideas informally last April at the initial meeting of a Boston chapter of the NSTA Business-Industry Section; and they were quite well received both by the science teachers and by the representatives of industry who were present. Can *you* use, or have you been using, any of these contacts with industry in your locality?

Mr. MacCurdy is head of the science department and teacher of biology in the Watertown, Massachusetts, Senior High School. He is much interested in problems of identifying and guiding students with unusual talents in science. He is currently working on a doctoral study along these lines at Boston University under the guidance of Dr. John Read.

b. By offering speakers to PTA groups.

c. By touring PTA groups through your plants and explaining the work done by your scientists and engineers.

4. Do you publicize your company and industry as a good place for scientists and engineers to work?

a. By advertising methods.

b. By sponsoring science and engineering radio shows.

c. By sponsoring science and engineering TV shows.

d. By preparing magazine articles and getting them published.

e. By glamorizing some science-talented youngsters before the public eye.

5. Do you take steps to provide major rewards, such as these?

a. Following up the recipients of awards and scholarships and getting them on your payroll.

b. Providing loans that can be repaid from the recipient's salary when he comes to work for you.

c. Providing small scholarships, say, $100 to $600, for high school students to get them started in college, summer school, or industrial school.

d. Establishing foundations to finance scholarships and other incentives such as have been set up by Ford, Rockefeller, Westinghouse, Bausch and Lomb, American Society for Metals, Fisher Body, National Science Foundation.

Many companies are doing *some* of these things now. *Some* of the companies are doing *many*. Shall we say that they are going fishing—for scientists and engineers? Do these companies who say they

(Please continue on page 233)

Announcing SCIENCE ACHIEVEMENT AWARDS—*The 1953 Program*

PLANS ARE NEARING COMPLETION for the second annual program of Science Achievement Awards sponsored by the American Society for Metals. The operating committee has defined the scope of the program and has established the array of awards to be offered. It is expected that a bulletin board poster announcing the contest will be mailed to secondary schools and to science teachers all over the country around the middle of October.

Based on experience with last year's program, the committee has recommended: (a) eight geographic regions rather than four; (b) a larger number of awards to students; (c) smaller cash value for student awards; (d) placques rather than cash awards to schools represented by winners of student awards; and (e) continuation of the awards for teachers.

This year's program will offer 104 student awards as follows: 24 awards with a value of $2000 for students in grades 11-12 for reports of their science work relating to metals, metallurgy, and applications of science in engineering; 40 awards with a value of $1500 for students in grades 9-10 for work in any field of science or mathematics; 40 awards for students in grades 7-8 for work in any field of science or mathematics. There will be 20 cash awards of $50 each for teachers' reports on the same basis as the 1952 program.

The awards program will be conducted by NSTA as a field of action of the Future Scientists of America Foundation. The committee in charge of the program is comprised of Mr. John B. Chase, Jr., *chairman,* Instructor in Education, University of Virginia, Charlottesville; Mr. John D. Atkins, Jr., Teacher of General Science, Stratford Junior High School, Arlington, Virginia; Dr. Charles E. Bish, Principal, McKinley High School, Washington, D. C.; Mr. John A. Bennett, Chief, Mechanical Metallurgy Section, National Bureau of Standards, Washington, D. C. The recommendations of this committee have been approved by the Administrative Committee of FSAF. The program has also been approved by the Committee on National Contests of the National Association of Secondary School Principals.

Designed to function chiefly as a catalyst to stimulating and nurturing early interests in science, encouraging *quality* work on an individual or small group basis, and promoting career thinking relating to science, engineering, and technician work, the program is not an essay contest and it does not utilize the "talent search" type of approach or methods of judging. However, this program should enable students to explore their interests and abilities to succeed with further work in science—possibly with a career in science. Science activity work undertaken for this program should help students prepare themselves to win other honors, awards, and scholarships for achievements in science, as in the Westinghouse Science Talent Search (conducted by Science Clubs of America), state talent searches, science fairs, and so on.

Science teachers are urged to encourage their students to get started NOW on suitable projects, investigations, or other science activities preparatory to entering the contest. Entries may be submitted at any time and the program closes May 31, 1953. Judging and the selection of winners will be done during next summer. Announcement and presentation of the awards will be made after the opening of school next September. For further information, write to the chairman of the operating committee, Mr. Chase, or to the executive secretary of NSTA.

CAN TITANIUM BE LUBRICATED?

By AUGUST SCHOMBURG

Editor's note. This report is based on a project entered in the 1952 Science Achievement Awards program sponsored by the American Society for Metals, conducted by NSTA. It won a second place award in the division for students in grades 7-10. August Schomburg is 16 years old and was in the tenth grade at the Watertown, Massachusetts, High School. His science teacher sponsor was Mr. Robert D. MacCurdy. (who, incidentally, has an article of his own in this issue of *TST*, p. 229).

August says he has always been interested in scientific subjects, but gives his biology teacher, Mr. MacCurdy, much credit for providing encouragement which deepened his interest. He was a member of his school's Science Seminar Society. His project on the lubrication of titanium was displayed at the Watertown High School Science Fair and the Massachusetts State Science Fair. Says August, "After working with metals and the wear machine, I am seriously considering studying metallurgy in college." August's father is an engineer with the U. S. Army, and has recently been transferred to northern Virginia. August is now a student in the Washington and Lee High School in Arlington.

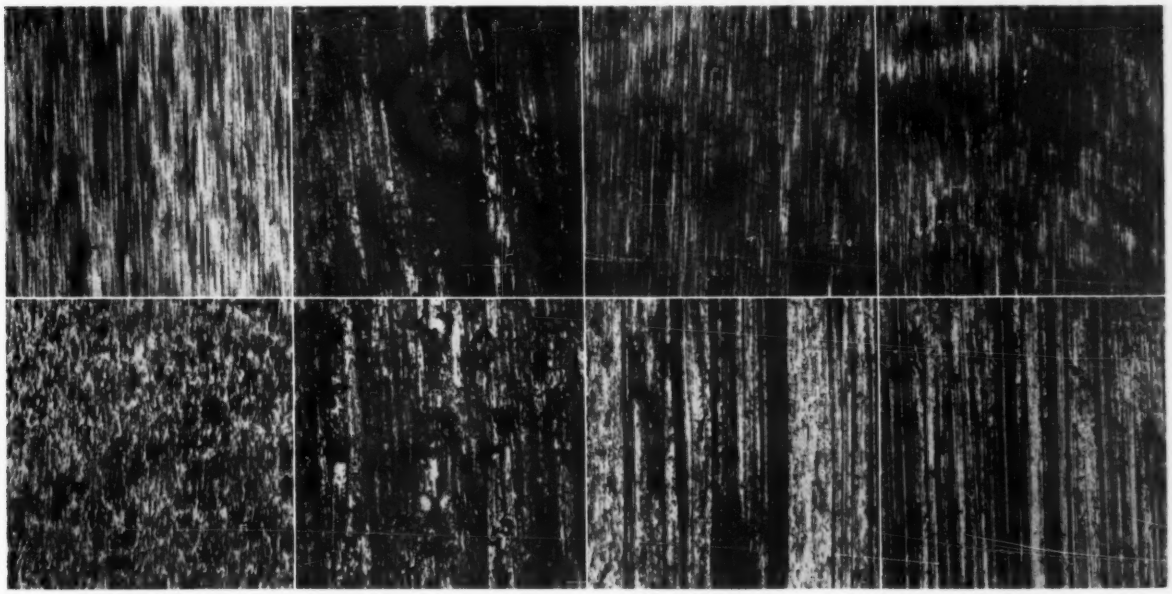
TITANIUM is a new, strong, light-weight, corrosion-resistant metal whose ores are available in huge quantities in North America. When alloyed it is as strong as steel but only six-tenths as heavy. Titanium has one great weakness—it is not wear-resistant. Fabricating methods are progressing, but it still galls. It was this fact that became the basis of my project: I felt that the problem of wear might be solved with lubricants not tried on titanium previously.

I built the wear machine (shown in the photo on page 243) which transmits a lateral motion of two and one-half inches per stroke, 200 times a minute, while the specimen is subjected to a pressure of 75 p.s.i. My tests were conducted with commercially pure titanium and ordinary carbon steel. All surfaces were ground.

Since titanium lubricated with oil galled in two minutes, this was made the standard time of all tests. Steel was used for comparison. Seven different lubricants were tried: namely, molybdenum disulfide, oil, water and household detergent, polyoxyalkylene ether of partial lavric acid ester with water, sodium alkylaryl sulfonate and water, high molecular alkydimenthol ammonium chloride and water, and oleic acid and oil.

The bottoms of the titanium samples and the brass base of the machine did not gall regardless of

(Please continue on page 243)



Steel samples shown across top, titanium samples across bottom. OUTSIDE LEFT, ground steel and ground titanium before test; LEFT CENTER, samples after two-minute test with no lubricant; RIGHT CENTER, oil used as lubricant; OUTSIDE RIGHT, sodium alkylaryl sulfonate and water used as lubricant.

High School Students Need Guidance

By LAWRENCE WILSON

Junior, Chemistry Department
Rochester Institute of Technology

At the Technical Institute Guidance Clinic referred to in this brief report, chance seating arrangements placed us next to Larry Williams. His story of how, as a senior in high school, he was unexpectedly confronted with college opportunities and how he had to "double up" on courses to get ready for entrance into an engineering program made interesting listening. Here, it seemed, was an evaluation and some good advice from a recent high school graduate—something we might all use to good advantage as we work with today's crop of high school youth. Larry responded to our request for a brief "here's my story" for *The Science Teacher;* and here it is. *Editor.*

EARLY IN MAY, 1952, I had the honor and privilege of attending a "guidance clinic" at the Mellon Institute in Pittsburgh, Pennsylvania. It was a thrill and a satisfaction, because I was seeing action—action that was going to give high school students of the future an opportunity I feel that I and several others missed.

I was graduated from Waynesburg High School, Waynesburg, Pennsylvania, in 1950. Among us farm boys, it was the policy to get a high school education, or less, and then work on the farm or take a similar job. My father was content to have me stay home, and when I would discuss going on to school and college, he never seemed very enthusiastic. But my mother did encourage me.

Looking back, I feel that I lacked the proper guidance when I entered high school and, likewise, when I was attending classes. I tried to get through school with the smallest amount of work possible. When I had a chance to go on to further schooling, I found that I did not have the necessary courses in mathematics to enter an engineering course. To make up the necessary requirements, I was forced

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to take two mathematics courses during my senior year, and that proved to be pretty difficult. I will never be able to understand why I did make up the math, because I had not, then, made up my mind to go on to school.

My enrollment at the Rochester Institute of Technology was a matter of chance and luck. My parents had a very limited income, and the cost of a college education could not be covered, along with other essentials, by my father's earnings. Because of my wrestling in high school, the wrestling coach of R.I.T. presented a plan by means of which I could get an education with a small cost to my parents. The plan he presented was the cooperative work system, which consists of working a period of time and going to school a similar period of time.

I am now a junior in the chemistry department and am employed by the Rochester division of E. I. du Pont. My first year was full-time, just as at any full-time college, but my second and third years are part of a co-operative program. I have earned enough to pay my tuition, fees, books, and a major portion of my other expenses, including room and board.

When I remember how I almost missed a college education, and how I "goofed off" for three years in high school because of lack of proper guidance, I pray that that will never happen to any other American boy or girl. I believe every high school graduate should be given a chance to go on to further education, and one of these chances is to acquaint the student with the various ways and means of securing an education.

When I saw the efforts of our educators at the Mellon Institute conference, I realized that a step in the direction of informing high school students of the various possibilities for obtaining an education was underway. This is the movement that I hope will grow, until the counseling or guidance department becomes one of the top departments in our school systems.

What is the use of preparing a student for further education without his going to the right school or knowing partially, at least, what he wants? Higher education is too expensive to be entered into blindly.

GOIN' FISHIN'—***continued from page 230***

want, and must have, more scientists and engineers merely wait for people to come and ask for a job? Or do they go and find the people they want? Fishermen sometimes catch unwanted fish and sometimes they catch few, if any. But they bait up again and go right on fishing. Good fishing to you!

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NSTA Activities

Atlanta Conference

To Emphasize Classroom Problems and Ideas

General plans for the NSTA Regional Conference on the teaching of science in elementary and secondary schools, to be held in Atlanta October 16, 17, and 18, were outlined in the September issue of *TST*. Since then, many additional program items have been developed to assure that the conference will ring with practical suggestions and ideas.

Limited space precludes giving the complete program here, but the following topics are representative of what the conference will offer: some elementary classroom experiments; science fair activities; teaching the carbon unit in chemistry; more "phiz" in physical science; combining testing with teaching; a beef heart demonstration for biology; simple physics experiments; field trips in your own backyard.

The above topics and many more will be considered in eight small-group work meetings Friday afternoon, October 17, and four such groups that will convene Saturday morning, October 18, prior to the last general session of the conference. There will be groups for elementary school science, biology, general science, and the physical sciences.

At the Friday morning general session, the spotlight will turn to *Imperative Needs for Science Education*. Dr. Allen V. Astin, Director of the National Bureau of Standards, will discuss "The Need for More Scientific Talent." Mr. James C. O'Brien, Assistant U. S. Commissioner of Education, will speak on "The Need for More Science in General Education." Dr. E. Laurence Palmer, Director of Education for the National Wildlife Federation, will discuss "Conservation Education—A Way to Provide for Needed Integration of the Sciences."

Dr. Hubert N. Alyea, Professor of Chemistry, Princeton University, will give a lecture-demonstration on "Atomic Energy: Weapon for Peace" at the Saturday morning general session. Widely known as a demonstrator *par excellence*, his presentation is certain to offer innumerable ideas for improved demonstrations in the teaching of science at all levels.

Twenty exhibitors have arranged to send to the conference displays of teaching aids for science—textbooks, laboratory supplies and equipment, business-sponsored materials, and other items. There will be ample time for all conferees to study the exhibits.

A number of social activities have been planned by the science teachers of Atlanta. Reservations will be required for these events and may be obtained at the time of registration at the conference or in advance by writing to Mrs. M. Gordon Brown, Science Coordinator, Board of Education, Atlanta, Georgia.

Also, write to Mrs. Brown to make suitable arrangements for housing and for additional information on details of the program, or to seek answers to other questions that may arise.

Policy Statement

For Science Education Developed by NSTA

At the Mills College meeting of the NSTA Board of Directors the summer of 1951, the incoming president was instructed to appoint a Policies Committee which would study (a) NSTA operating structure and policy actions taken during recent years, and (b) current issues, problems, and policies in education in general and in science education in particular. The committee was charged with the responsibility of presenting to the Board at its next meeting a proposed "Policy Statement" designed to guide the Association in its future professional endeavors.

President Arthur O. Baker appointed the following committee: James G. Harlow, *chairman*, University of Oklahoma; Glenn O. Blough, U. S. Office of Education; Ralph W. Lefler, Purdue University; S. Ralph Powers, Teachers College, Columbia University; Morris Meister, Bronx High School of Science, New York City. The report of the committee as adopted by the Board of Directors at the Ann Arbor meeting is as follows:

"The Policies Committee of the NATIONAL SCIENCE TEACHERS ASSOCIATION believes that science education in the public schools is entirely continuous with the remainder of public education, and that science education must therefore share responsibility for and participate in the achievement of the humanitarian and democratic aims which characterize best public education in the United States. It calls upon all science teachers to plan and to execute their contributions to public education in full cooperation with their colleagues in other educational fields. The Committee believes, however, that science teachers, like other special area teachers, contribute uniquely to the educational effort to achieve those humanitarian and democratic aims, and that those special contributions, formulated in terms of specific aims for science education, constitute a valid set of guideposts for the design and conduct of present and future programs of action of the NATIONAL SCIENCE TEACHERS ASSOCIATION.

"The Committee further recognizes that the professional effort of the NATIONAL SCIENCE TEACHERS ASSOCIATION is a part of the total professional effort of the teaching staff of the United States, and that for maximum effectiveness, NSTA's effort must mesh with the professional efforts of other teachers associations of the nation. Consequently, the Commit-

tee has selected the Centennial Action Program of the NEA as the principal program with which the NSTA effort must be integrated, and has drawn freely from the NEA goals for the Centennial Action Program in formulating the statements of the goals for NSTA which are proposed below.

"The Policies Committee believes these statements to embody the most nearly valid special objectives for science education in the public schools in the United States today, and therefore proposes them for adoption as the basic educational aims of the Association:

1. The development of effective personal adjustment consistent with current scientific knowledge of the physical and biological environment, as a means toward achieving confidence and security in the world of today.
2. The development, by each young person, of the habit of seeking the most reliable data to be used as a basis for discussion and in the determination of group and individual action.
3. The achievement, by all youth, of a clear understanding of the crucial dependence of the socio-economic life of the United States on the scientific and technological enterprise.
4. The location and support of those young people who show promise of growing into productivity in the scientific endeavor.

"The Committee believes the achievement of these special science education objectives to be so necessary to the continued political and economic health of the United States that it proposes for the central aim of the Association, until the aim is substantially achieved:

5. The establishment of adequate science education opportunity, in terms of the objectives above, for each child and youth at each grade level from one through twelve.

"The Committee further believes that, in view of the present situation in science education in the United States, the achievement of this central aim requires the establishment of the following contributory Association aims:

6. An adequate science education supervisory staff in each state department of education.
7. A professionally prepared and competent person in every science teaching position.

"The Committee holds that the most promising means by which to move toward the achievement of the two contributory aims and the central aim is through cooperation of interested and competent persons throughout the nation. It therefore proposes as specific and immediate Association goals:

8. A strong and effective state science teachers association in every state.
9. A larger and more effective NATIONAL SCIENCE TEACHERS ASSOCIATION.
10. Broader participation of state science education leaders in the formulation and execution of national association policies."

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Pittsburgh National Convention To Be Big Scale Operation

According to present plans, the first national convention of NSTA, to be held in Pittsburgh next March 19, 20, and 21, will be the largest and most comprehensive meeting of science teachers ever held in this country.

Most urgent need NOW is for science teachers everywhere to begin their planning to attend the convention. As already pointed out, many school systems will gladly release teachers with substitutes provided in order to permit attendance at such national meetings. Teachers who would be helped in making such arrangements by being on the program should volunteer immediately. Since the required personnel for the work groups and for the "Here's How I Do It" sessions have not yet all been "signed up," there is still time to get on the program.

Members of the general planning committee are: Dr. Nathan A. Neal, past president of NSTA and editor of secondary textbooks, Harper and Brothers, New York City; Mr. Arthur O. Baker, retiring president of NSTA and directing supervisor of science, Cleveland, Ohio; Mrs. Marjorie Campbell, supervisor of elementary science, Washington, D. C.; Mr. Robert H. Carleton, executive secretary of NSTA, Washington, D. C.; Dr. Charlotte L. Grant, president-elect of NSTA and teacher of biology and dean of junior girls, Oak Park-River Forest High School, Oak Park, Illinois; Dr. Philip G. Johnson, past president of NSTA and specialist for science, U. S. Office of Education, Washington, D. C.; Dr. Eugene Peckman, supervisor of science, Pittsburgh, Pennsylvania; and Dr. Harold E. Wise, president of NSTA and assistant dean of the graduate college, University of Nebraska, Lincoln.

The first work session to develop plans for local arrangements was held in Pittsburgh on October 3. The meeting, arranged by Dr. Peckman, was attended by sixteen delegates who represented: the Pittsburgh public schools, the Allegheny County public schools, Catholic schools of the Pittsburgh Diocese, the Pittsburgh area independent school districts, the Pittsburgh area colleges and universities, the Pittsburgh chapter of NSTA Business-Industry Section, and various scientific and educational societies of Western Pennsylvania.

Classroom Ideas

Physics

A Variation of the Dancing Coil Experiment

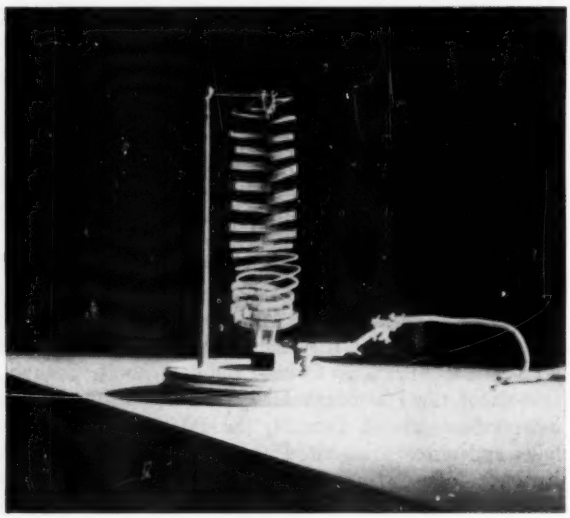
By GEORGE R. TRACY, Polytechnic High School, Long Beach, California

The photo below shows the familiar dancing coil in an unfamiliar pose! Careful observation will show that the upper and lower segments are vibrating, while in between, one turn is acting as a fixed node. In other words, the coil is vibrating in its first overtone or second harmonic. The ribbon-like appearance of the turns in the upper and lower parts of the coil shows the intense vibration of those parts.

The electromagnetism causes the adjacent turns to draw together, lifting the lower end of the wire from the pool of mercury, thus breaking the circuit. The wire then drops back and the cycle is repeated.

If, however, while the coil is dancing at this fundamental frequency, it is lightly tapped, higher frequency vibrations are set up. The coil soon settles down into a steady vibration pattern of twice the former frequency. At one particular turn, the rising wave meets a reflected wave exactly out of phase, thus establishing a node.

A rather heavy current (5 to 20 amperes) is required. DC is usually used, but AC also works. See why? This particular coil is made of #16 copper wire.



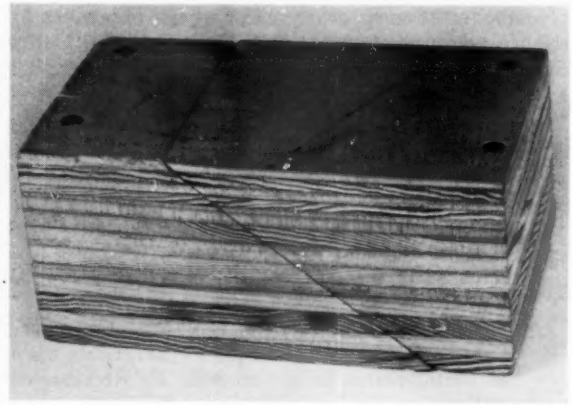


FIGURE 1. The demonstration model showing fault line.

General or Earth Science

Visualizing Geological Faults

By PAUL L. GUPTILL, Science Department North Fulton High School, Atlanta, Georgia

Few teachers of general science can indicate good examples of geological faulting on or near their school grounds. Even simple faults are difficult to visualize by means of word descriptions. Blackboard drawings require considerable skill to present in three dimensions. Students often fail to interpret textbook illustrations. It is possible to overcome some of these difficulties with a single, easily constructed model.

To represent beds of sedimentary rock, nail or glue several pieces of plywood together to form a block. Larger demonstration models may be made by using varying thicknesses of boards if so desired. Then cut the block at an angle to form a fault line. (See figure 1.) Place two headless wire brads or small wooden dowels in one face of the block in such a way as to fit into holes drilled in the other face. In this way the two pieces of the block are held together.

Different kinds of faults may be illustrated by this model as shown in the pictures and described in their captions.

Chemistry

Making Rayon

By NIELS MADSEN, Instructor in Industrial Chemistry, Essex County Vocational and Technical High School, Newark, New Jersey

The coagulation of rayon may be effectively demonstrated with very simple equipment.

Such a set-up may be made from a tall graduated cylinder containing a 5 per cent sulfuric acid solution and a test tube drawn out to a capillary and suspended with the point barely touching the surface of the acid. The graduate thus simulates a coagulating bath and the test tube a spinerette. When a cellulose solution is poured into the test tube, a flow is started by applying a slight air pressure to the top, a fiber of "rayon" will appear. The process will continue until the test tube is empty.

The following procedures may be used to prepare a solution of cupro-ammonium cellulose suitable for use in the demonstration. Cover 10 g. of filter paper with concentrated hydrochloric acid and warm slightly on a water bath. Add water and stir the mixture to disintegrate the paper. Filter off the pulp and wash to remove the acid. Suspend the pulp in 50 ml. of a 20 per cent solution of copper sulfate. Precipitate the copper with 15 ml. of a 20 per cent solution of sodium hydroxide; this produces an intimate mixture of paper pulp and copper oxide. Filter and wash free of sodium hydroxide. Finally, dissolve the mixture in 50 ml. of concentrated ammonium hydroxide and then dilute with 40 ml. of water.

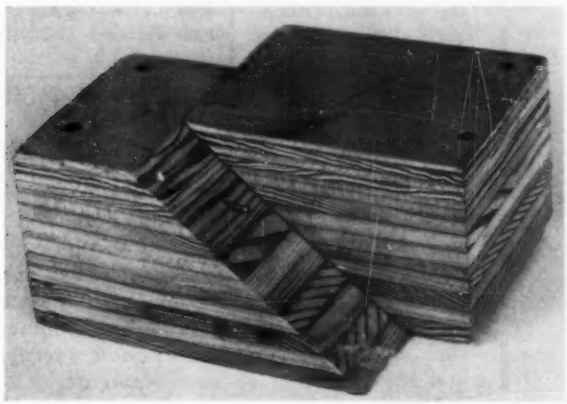


FIGURE 2. Horizontal fault. This type caused the San Francisco earthquake.

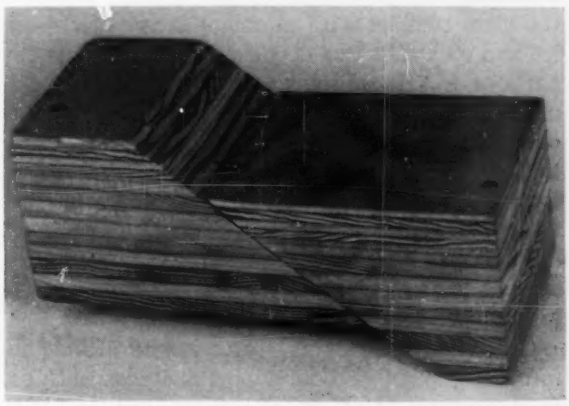


FIGURE 3. Normal fault. Probably the most common type of fault.

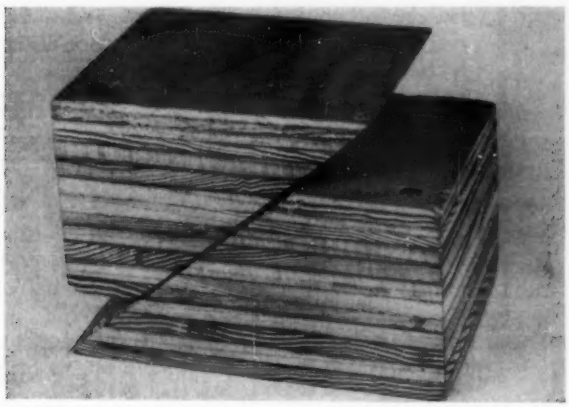


FIGURE 4. Reverse fault. Lake Tahoe in California was formed by this type of fault.

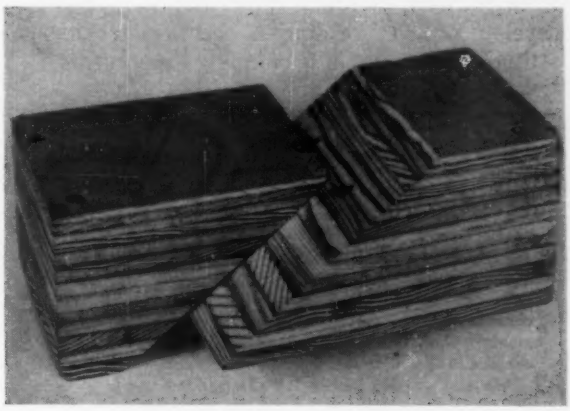


FIGURE 5. Oblique fault. This type must have vertical as well as horizontal movement.

Elementary School Science

Making Frost

By DWIGHT SOLLBERGER, Head of the Science Department, State Teachers College, Indiana, Pennsylvania

With the fall and winter months coming on and bringing pronounced seasonal changes to most parts of the country, it is appropriate to consider what related science activities are suitable for working with youngsters at this time of year. "Making Frost" would seem to fit the bill.

The materials needed are very simple: an ordinary glass tumbler, half a dozen or so ice cubes, about three tablespoons of rock salt, a thermometer, and a hammer or hand-size stone for crushing the ice cubes.

To make the frost, first crush the ice cubes by pounding with a hammer or the stone. Then pack the glass tumbler with alternate layers of crushed ice and rock salt. Use about one part of salt to two parts of ice. To introduce the "quantitative" side of science, place a thermometer in the mixture to observe the temperature at which the frost begins to form; also, the lowest temperature reached by the mixture can be observed. To introduce the idea (at suitable grade levels) that "conditions make a difference," repeat the experiment in different rooms, or on different days, with varying amounts of moisture in the air.

Outcomes of "making frost" might include information, skills, and developing attitudes, such as: frost may form on objects at a temperature of 32° F. or lower; a salt and ice mixture may develop a temperature lower than "freezing"; salt causes ice to melt; the material in a thermometer expands when warmed, contracts when cooled. Pupils may develop skill in reading a thermometer and an attitude of interest in performing experiments.

Stained Cells and Brain Cells

The word cell means, literally, "an empty space." And that is what the brain of the beginning student is likely to be if he does not learn what, biologically, a cell is. All students, whether or not they intend to be professional biologists, should have a chance to study a variety of cells and tissues, living and preserved. In other words, comparative histology. Because cellular biology is fundamental to all the sciences, including the study of cancer, cardiac lesion, and arteriosclerosis.

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Book Reviews

CHEMISTRY IN ACTION, Second Edition. George M. Rawlins and Alden H. Struble. 575 pp. $3.60. Heath and Company. Boston. 1952.

This well-illustrated text is the outgrowth of a course of study tested in public schools for six years. Major objectives of the authors, both experienced in secondary science teaching, are "to help young people to understand and appreciate the role of chemistry in their lives, and . . . to reason scientifically."

The eight units of the book are subdivided into problems with adequate review and summary questions. Stressed are the units on metals and organic chemistry, the latter being unusually complete and detailed. The revised edition ably discusses such modern developments as insect pest control, synthetic rubber and plastics, and nuclear energy. The few errors noted were minor ones.

Besides the usual tables, glossary, and reference bibliography, the appendix contains a correlated, up-to-date list of useful films and a discussion of Einstein's matter to energy equation. Available are a teacher's handbook, laboratory manual with key, and tests with keys.

G. DAVIS CHASE
New Britain Public Schools
New Britain, Connecticut

EXPLORING PHYSICS. Hyman Ruchlis and Harvey B. Lemon. (Paul F. Brandwein, Editor). 647 pp. $3.96. Harcourt, Brace and Company. New York. 1952.

Teachers of physics have long awaited the publication of a textbook which would attempt to present a new and fresh approach to the standard topics usually found in the high school physics course. The authors, under the competent editorship of Dr. Brandwein, have made such an attempt. The result is a physics textbook which should prove popular to teachers and to students of all levels of ability.

Gone is the old and traditional approach which presented physics as a dry, abstract subject far removed from the daily life of the student. In its place is an approach which relates the science of physics in a functional manner to the student's environment and experiences. Physics is presented as a subject which has immediate value to the learner and which can be used to help the student solve the problems that now confront him.

The pictures and diagrams have also broken away from the older traditions. The numerous illustrations are novel and ingenious and possess considerable instructional value in addition to arousing the interest of the student.

The non-traditional approach of the authors has not resulted in a "watered-down" textbook nor in a book containing scientific inaccuracies and misconceptions. The mathematical physics needed for college entrance is thoroughly covered. However, the more difficult mathematical calculations have been placed in separate sub-sections so that they may be used optionally, dependent upon the nature and capabilities of the individuals and groups using the book. The exercises, problems, and suggested projects placed at the end of each chapter should offer to most students an interesting and challenging opportunity to apply the principles they have just learned.

The material is as up-to-date as this morning's newspaper. It is possible for the headline-conscious student to find within the pages of this book extremely satisfactory discussions of such topics as the medical applications of radioactive isotopes, the hydrogen bomb, the transistor, and radar.

This attempt to break away from the conventional approaches to the teaching of physics has resulted in a textbook which will probably be widely accepted by many schools. The authors have blazed a new trail which undoubtedly will be followed and improved upon by authors of future textbooks. At present, this textbook merits the careful consideration of all those physics teachers who have been looking for a textbook with a fresh approach.

HAROLD S. SPIELMAN
City College of New York

A LABORATORY COURSE IN BIOLOGY. By James C. Adell and Louis E. Welton. 282 pp. $2.20. Ginn and Company. Boston. 1951.

This course, in soft-covered manual form, emphasizes experiments, projects, big ideas, and questions for study. Many problems are phrased engagingly. Informal narratives and textual material open each unit and experiment. The latter, better called ac-

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tivities since many are demonstrations and deductions from reading, supplement the concepts in the text. The unit activities include flowers, insects, cells, ecology, etc. These activities lead pupils to find answers to problems such as, "Can Animals Live in an Airtight Aquarium?" Some "experiments," as those on ecology, are merely guiding questions for reading and chart interpretation. Others provide for manipulation, observation, and drawing of conclusions.

Most illustrations are simple. Some are reproductions from college texts. These, with their technical terminology, detract from the over-all simplicity of the course.

With selection, the units and experiments may provide a valuable source of activities for learners with varying interests and abilities.

MILTON S. LESSER
Thomas Jefferson High School
Brooklyn, N. Y.

ELECTRICAL COMMUNICATION EXPERIMENTS. Reed, Wagner, and Corcoran. 451 pp. $6.75. John Wiley and Sons, New York. 1952.

This book is prefaced by a very useful chapter on electrical measurements in general in which the student is introduced to the various kinds of experimental errors which he may expect to encounter. There is also a discussion of the recording and interpretation of data in physical measurements. There are 60 experiments in all, progressing from basic circuit tracing through DC and AC instruments to vacuum tubes, resonant circuits, and radio frequency measurements. The book should find application as a laboratory guide to be used by college communication, electronic, and engineering students beginning at the sophomore level. Facility with the calculus is indicated to follow the development of certain formulas. The emphasis is on gaining experience in the techniques of good measurement rather than on a familiarization with specialized instruments. The apparatus needed, such as voltmeters, ammeters, and bridges, is that normally found in engineering and physics laboratories. Valuable features from the teaching standpoint include a very complete theoretical development preceding the actual laboratory exercise, reports suggestions, and lists of selected readings for further study. This book is one of a series of electrical engineering texts written by Prof. Corcoran and his colleagues.

M. M. HASSE
Central High School
Aberdeen, S. Dak.

METEOROLOGY, AN ELEMENTARY TEXTBOOK. James R. Wilson and R. J. Hannelly. 92 pp. Paper cover. $2.40. Printery Publishing Co. Phoenix, Arizona. 1951.

TEACHERS OF PHYSICS and physical science who have been looking for a meteorology textbook, written for students at the high school level, will find in this book all that they desire. It is written by two experienced teachers and contains just the sort of text material, diagrams, tables, charts, maps, glossary and bibliography that are needed.

There are chapters on clouds, air masses, fronts, storms, weather maps, and other weather elements. Applications include a study of meteorology in aviation, tomorrow's weather, and artificial rain making.

Although intended for use during a one semester course, by suitable selection, it might well be used for a shorter period while studying a unit on weather in a physics or physical science course.

A workbook to accompany this text is being prepared but is not ready for sale at this time.

Mahlon H. Buell
Ann Arbor High School
Ann Arbor, Michigan

THE WONDERWORLD OF SCIENCE, A series—Book One through Book Eight. Meister, Knox, Stone, Noble, Wheatley, Kierstead, and Shoemaker. Charles Scribner's Sons. New York. 1950.

This very attractive series is a true integration of science interests from Grade One through Grade Eight. The sciences are woven together very smoothly with the biological interests being given a nice balance throughout the series. The drawings and illustrations are extremely well done with proper and understanding artistic talent used for each of the grade levels. Color is used generously in the books to add to the attractiveness and ease of understanding. There is no repetition or cycling in the books. The interests of children are used as the basis for the approximately seven interest-activity units in each of the eight books. Each of the books has one special interest unit directly connected with understanding of better personal health and better body care and grooming. Even "Atomic Energy for Better Health" is found in Book Eight.

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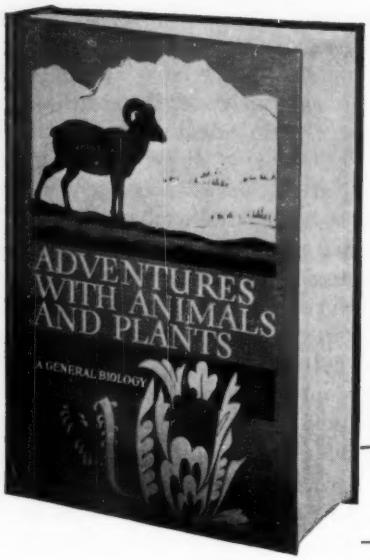

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All books have a table of contents, the first six books have teaching notes at the end of the book, the first two books have a word list for word study use, and Books Seven and Eight have a glossary. The page numbers run from 136 for Book One, to 264 for Book Five, to 360 for Books Seven and Eight.

This series with its layout and content represents the best of the recent thinking on elementary school science and should furnish students and teachers alike with that fine combination of inspiration and concrete ideas needed to capitalize on the vast storehouse of learning experiences and material with which the science field abounds.

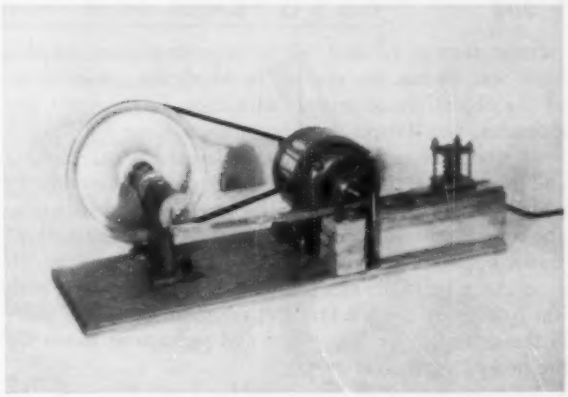
RUSSELL MCDOUGAL
Indiana State Teachers College
Terre Haute, Indiana

PRINCIPLES OF RADIO (Sixth Edition). Henney and Richardson. 641 pp. $5.50. John Wiley and Sons, New York. 1952.

This new edition of a standard text of basic radio and electronics which was first used extensively in the pre-induction training programs ten years ago should find wide reception. It retains the valuable feature of presenting examples illustrating the principles, followed by numerous problems for the student. The examples, problems, and suggested experiments are those most likely to be encountered in actual practice. Graphs, charts, and diagrams are used freely. There are eight chapters devoted to basic DC and AC before the student is introduced to the vacuum tube. Several sections on the newer developments in the fields of test equipment, transmission lines, UHF techniques, wave guides, and wave-shaping circuits have been added. Their applications to television, radar, and loran follow in later chapters. The mathematics used is confined to arithmetic, simple algebra, the sine, cosine, and tangent functions in trigonometry, "engineers' shorthand" (i.e. powers of 10), and graphing. Phase relationships in AC are solved by vector diagrams. This book, written by two men who combine many years of successful experience in teaching, editing, and research, is a text well suited for use in technical high schools and vocational schools.

M. M. HASSE
Central High School
Aberdeen, S. Dak.

TITANIUM—*continued from page 231*



lubricant used. The following sets of photographs show some of the results of my work at 25 diameters. I found that surface active agents with water gave the best results with titanium. Since titanium is corrosion-resistant, water can be used.

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GUIDED MISSIVES—*continued from page 202*

column format is used." The crowning glory of this book was, to me, the manner in which the achievement of the objectives of science education, i.e., method and attitudes, was taught for throughout. Here we have a book which never forgets the exercise of critical thinking and presents activities at the end of each section in which the elements of scientific method and attitudes are consciously and recurrently taught. The distinctions drawn between experiments and demonstrations, which in so many texts are considered synonomously, and with which so many science teachers are unfamiliar, are made in the nature of an innovation and perhaps as much for the benefit of teacher as pupil.

Johnson writes, "Many problems of living in the environment are touched upon." Touched upon seems to be a very limited evaluation of the author's approach. The material in this book is handled as real problems of genuine significance which meet various criteria for problem selection. Many texts state simple questions which are not real problems at all. In fact, it seems to me that if any one of the innovations of this book were to be declared the keynote, this very orientation to problems of living in the environment would perhaps be so named.

The claim that "Too many extraneous topics are brought in which serve only to confuse the larger problems," can be countered with the claim that where such confusion exists a service is performed; or would not the reviewer regard well-calculated confusion a service? However, confusion is not the only service thereby performed. At any rate, *Consumer Reports* has been campaigning for years to get Europe's nickel-cadmium battery ("two inches") into production in the United States as it outlasts the lead storage battery ("three inches") several times over. If a sufficient number of people are educated to this fact, many ninth-graders *are* likely to come in contact with the nickel-cadmium battery.

When this book first came to the writer's attention, it gave a remarkable impression of flexibility for all groups of learners—average, slow, and bright. It will be used this year in a seventh grade class for slow learners, although admittedly it will take some contriving. Colleagues teaching advanced classes received it as well as those of slower classes. We do not anticipate that the reviewer's prediction will hold; namely, that the book will be ". . . useful for the average student, a bit difficult for the slow learner, and not too helpful for the brighter students."

FRANK E. WOLF,
Wilmington, Delaware

TEACHER AWARDS—*continued from page 224*

munity are called upon for cooperation and assistance along such lines as needed materials, technical information, and general encouragement.

SILBERMAN, HARRY F. (*HM*) Science Teacher, Anderson (Calif.) Union High School. "Ideas for Science Teaching." A collection of workable projects and activities, interest builders, and public relations ideas in science and mathematics.

SISTER MARY RUTH, S. M. (*A*) Biology Teacher, Mount St. Mary's Academy, North Plainfield, New Jersey. "Nature Conservation Workshop for Students." Tells how biology learning can take place out-of-doors; how sophomore girls organized into groups of "lumber jacks," "bulldozers," and so on to build a bird sanctuary, a nature trail, and a rock garden.

STRAHLER, VIOLET. (*HM*) Teacher of General Science and Chemistry, Wilbur Wright High School, Dayton, Ohio. "A Good Life for Students and Teachers in Science." A series of case histories pointing to the mutual satisfactions in extensive pupil-teacher planning and working together. Reports on several unusual teaching ideas.

SUBARSKY, ZACHARIAH. (*A*) Teacher of Biology and General Science, Bronx High School of Science, New York City. "Weekend Camping—Learning By Doing." Fourteen students, three teachers, and a parent spend a weekend "camping out" and doing chores on a dairy farm.

THORPE, DANIEL S. (*HM*) Science Teacher, Washington High School, Atlanta, Georgia. "Demonstration to Show Action of the Valves of the Heart." Illustrated description of a large-scale demonstration item.

VERSEPUT, ROBERT F. (*HM*) Teacher of Chemistry and Physics, Dover (N. J.) High School. "An Electronics Demonstration by High School Students." Describes a student science demonstration used before several school assemblies, at the school's spring exhibit, and before three local service clubs. This report was published in the September, 1951, issue of *The Science Counselor*.

YARIAN, S. ALTON. (*A*) Teacher of General Science, Emerson Junior High School, Lakewood, Ohio. "The Micro Club." Science interests are built and knowledges and skills are gained as the students in this club take field trips to collect specimens for use in microphotography, microprojection, and in devising exhibits for school library, school assembly, and community display purposes.

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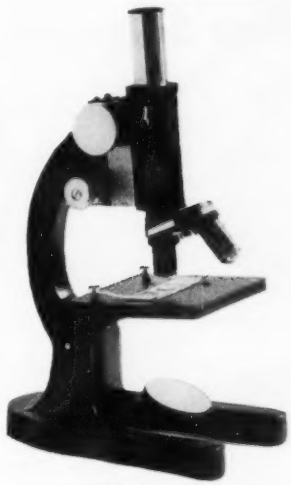

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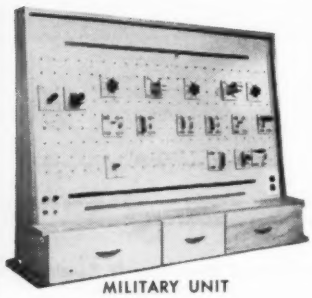

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